Consulting Engineer

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Continued on page 8

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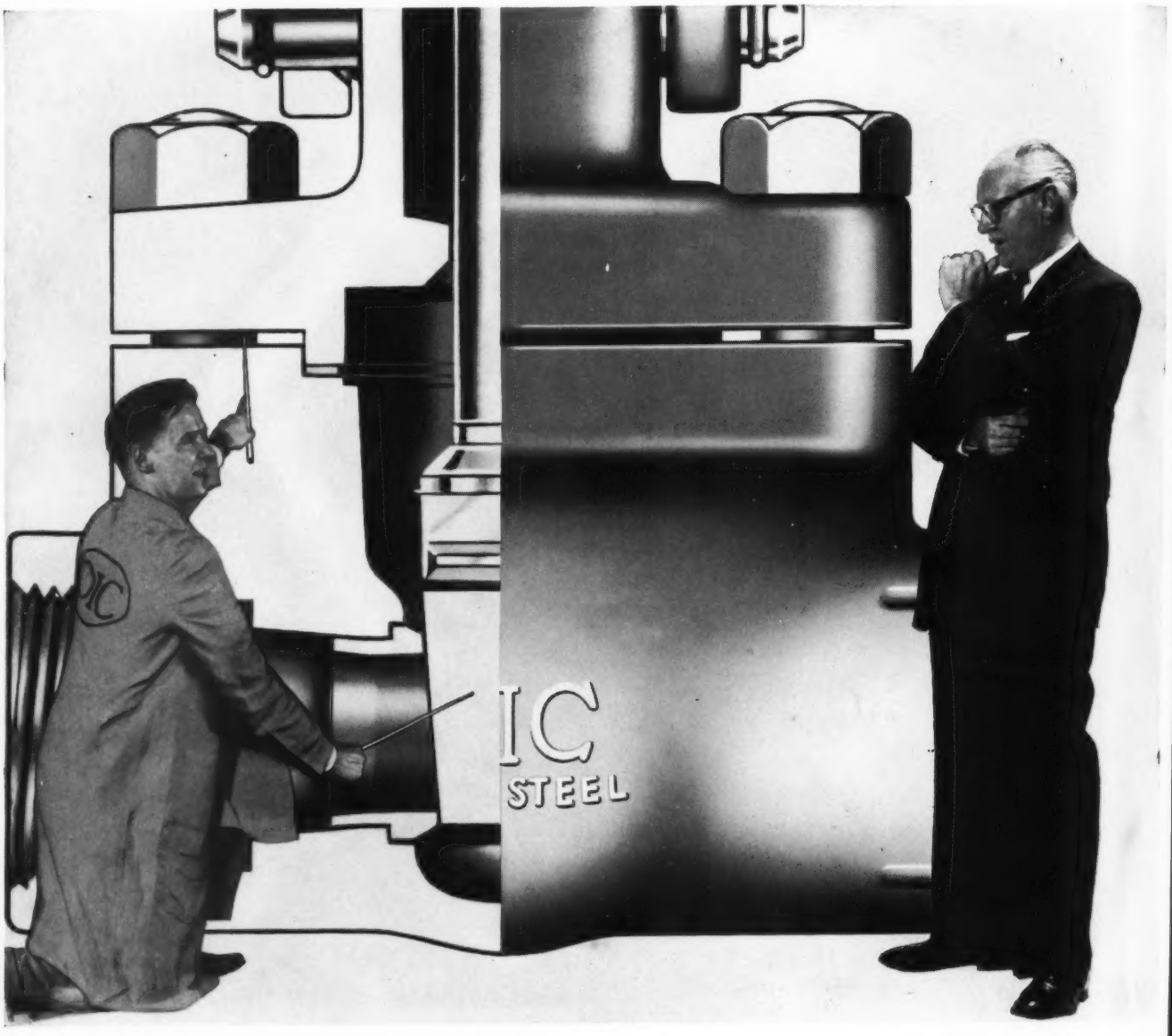

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Consulting Engineer

The Consulting Engineer's Professional Magazine

October, 1957 · VOLUME IX · NUMBER X

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GENERAL ELECTRIC

A. C. Kirkwood

Starts on front cover

partner in July of this year. A small organization with three registered engineers and a staff working with the partners, it nevertheless is extremely versatile and has had broad experience in a number of fields. The firm is capable and qualified to perform engineering services in power generation, transmission, and distribution; water supply, treatment and distribution; sewerage facilities; streets, bridges, and drainage; and feasibility and rate studies. Members of the firm are registered as professional engineers in 14 midwestern states and in California and Oregon. A. C. Kirkwood himself, is registered in eight states and holds a National Board certificate.

Prior to opening his own firm, Kirkwood was with Wood & Weber, Consulting Engineers, from 1924 to 1929, and Burns & McDonnell Engineering Co., where he was an associate and principal engineer from 1930 through 1946. He is a member of ASME, AIEE, the Engineers Club of Kansas City (Past President), and the American Water Works Association. His primary association activity has been in connection with the National Society of Professional Engineers and that Society's state organization, the Missouri Society of Professional Engineers, of which he is immediate past president.

A. C. Kirkwood was one of the prime movers in the formation of NSPE's Consulting Engineers Functional Section. He can take some of the credit for the adoption of Bylaw 22 of NSPE's Constitution which authorizes the establishment of National Functional Sections. This bylaw was adopted by the Society at their annual meeting in Atlantic City in May of 1956.

Interviewed in his office in Kansas City, Mr. Kirkwood had this to say about the current status of NSPE Functional Sections and their future:

Question: Mr. Kirkwood, there are many consulting engineers in this country who think, rightly or wrongly, that there is an area of conflict between the activities of the various state associations of consulting engineers and the Consulting Engineer Functional Section of NSPE. What is your feeling on this?

Answer: Actually, the goals of these two groups are similar. I feel certain that some day there will be an amalgamation of some sort. Perhaps we should go back a little into the history of the situation. You will remember that the concept of the Functional Sections within NSPE had its beginning at our Board meeting, in Memphis, in October of 1955. This was shortly before the first meeting of several state associations in St. Louis, in late October of that year, at which time they looked into the possibility of getting together into what is now the Consulting Engineers Council. I was invited to attend that St. Louis meeting and was privileged to participate in it. At that time I was fully convinced that the best approach to a solution of the many problems of engineers in private practice was through the National Society of Professional Engineers, its state organizations, and the many chapters functioning under these state organizations. I am still convinced that this is the proper approach.

The Profession as a Whole

Although never doubting the sincerity of those consulting engineers at St. Louis who decided to set up a separate organization and recognizing that they felt that this was the proper approach, I could not agree with them for what I believe are very basic reasons.

Engineers in private practice frequently have put much emphasis on the fact that they are in private practice, often too little on their status as engineers. All engineers, regardless of whether they are in government, industry, education, or private practice, have a common heritage and common interests. We should view ourselves as engineers first and as private practitioners second. There is little justification for the occasionally expressed feeling that consulting engineers are something apart from other engineers who are employees of government, industry, or the technical institutions. While we have every right to be proud of our status as private practitioners, it does not mean that we are either better engineers or more professional in our actions.

Even more important, all engineers should be interested in the welfare of the entire profession. It takes combined effort to accomplish our over-all aims. It is perfectly obvious that we can accomplish these aims better and faster if we all work together rather than by splitting up into separate, small groups.

A Forum Was Needed

Two years ago it became obvious that there was need for adequate forums for discussion of problems in the various fields of engineering employment. It was clear to me that we could best work through a healthy, functioning organization such as NSPE which represents a cross section of all engineering branches. Since the organization was there, ready and waiting, there was no need to branch off into separate little groups that, through lack of size alone, were bound to be less effective than a large and active national organization. Is it not obvious that on matters such as legislation involving consulting engineers, we can get more effective action if we have the support of all engineers rather than

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in

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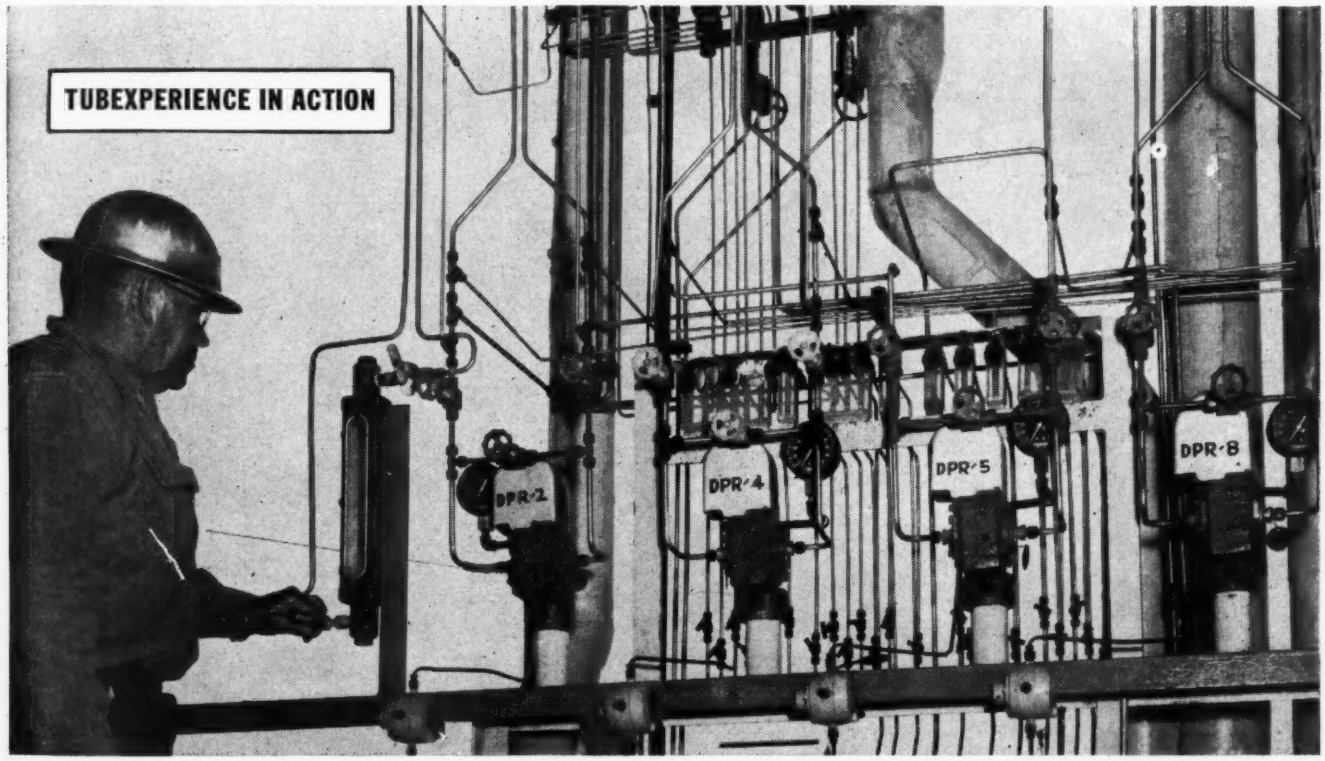

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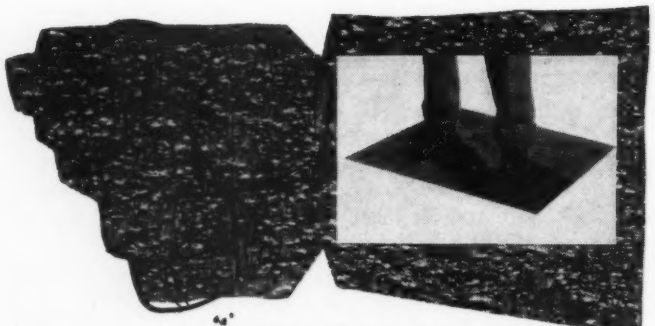

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of only that smaller group of engineers who are in private practice? In other words, legislators, public officials, industrial leaders, and others will be more impressed when we speak in unity as engineers rather than as members of but one facet of the engineering profession.

Q. That explains your reason for favoring the Functional Section concept. Now, how much progress has been made in setting up local and state Functional Groups?

A. I believe that we have made very good progress. On the national level there is considerable enthusiasm for functional sections. This applies not only to consulting engineer functional sections but also to the development of sections for engineers in government, industry, education, and other groups with common interests. The national consulting engineers section is working through state society secretaries and presidents and through the section's six regional vice-chairmen to encourage formation of state and chapter functional sections. Noteworthy are the several Ohio functional groups that have been successful for many years. Many other state and chapter sections have been formed. We now have a strong functional section here in Kansas City. There are functional sections formed or being formed in Texas, Kansas, and Wisconsin, to name only three.

Efforts are Spreading

Our functional section efforts in Kansas City are spreading and there is now being formed a Missouri section, with help, incidentally, of some of the stronger supporters of the Missouri Association of Consulting Engineers, which was one of the Founder Groups of the Consulting Engineers Council. I do not doubt but that this type of organization, the Functional Section, will spread rapidly in the future not only for engineers in private practice but for those in other employment categories.

Q. Many consulting engineers think that contractors, manufacturer's representatives, and others who are not, strictly speaking, consulting engineers should not be permitted to participate in organizations set up to solve the problems of private practice. Yet the National Society of Professional Engineers' Bylaw 22 dealing with Functional Sections says that "participation in any national level functional section (s) shall be open only to members of the National Society having professional problems and interests in common with the Section." This wording would seem to permit almost anyone to participate in Consulting Engineer Functional Group activities. Is this true?

A. No, that is not true. National Bylaw 22 has been

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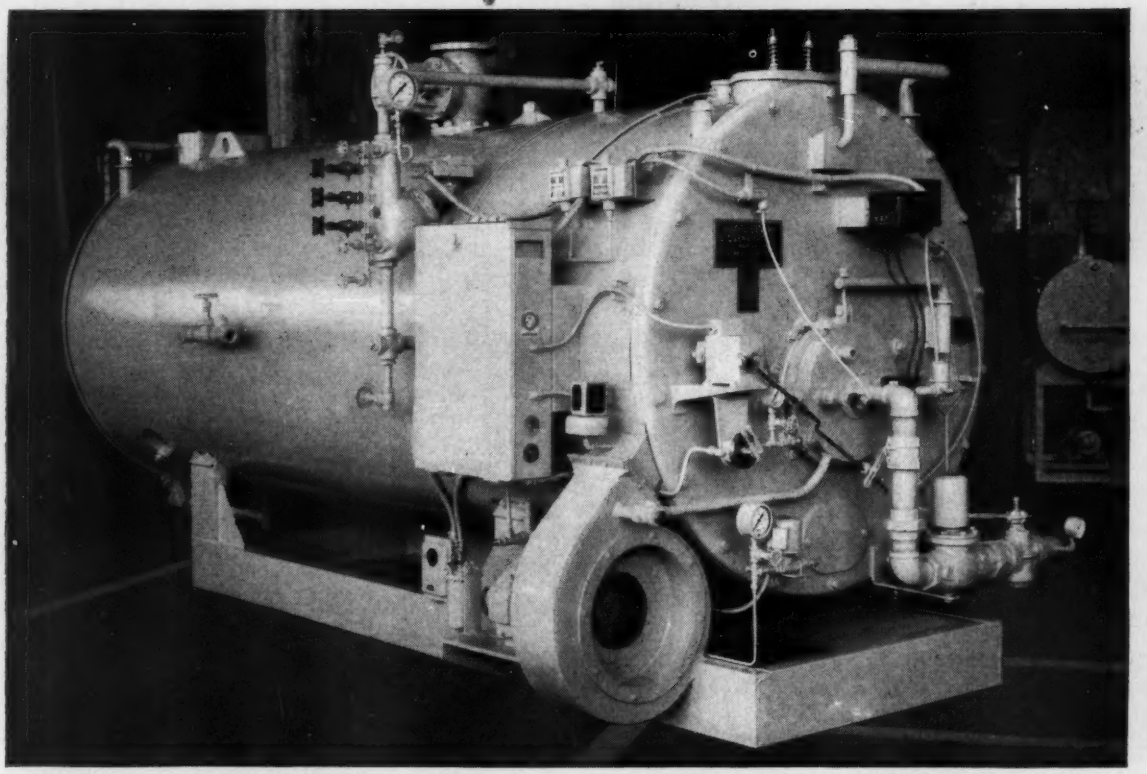

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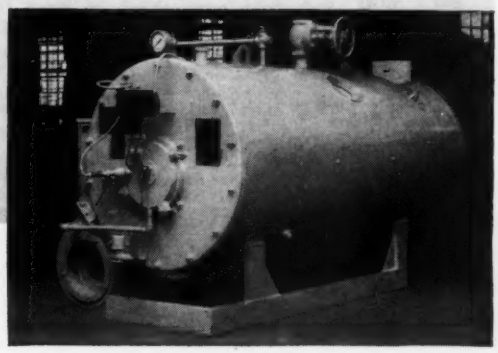

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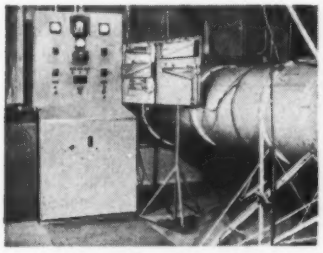

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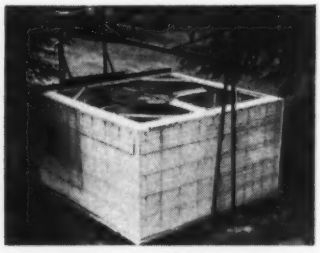

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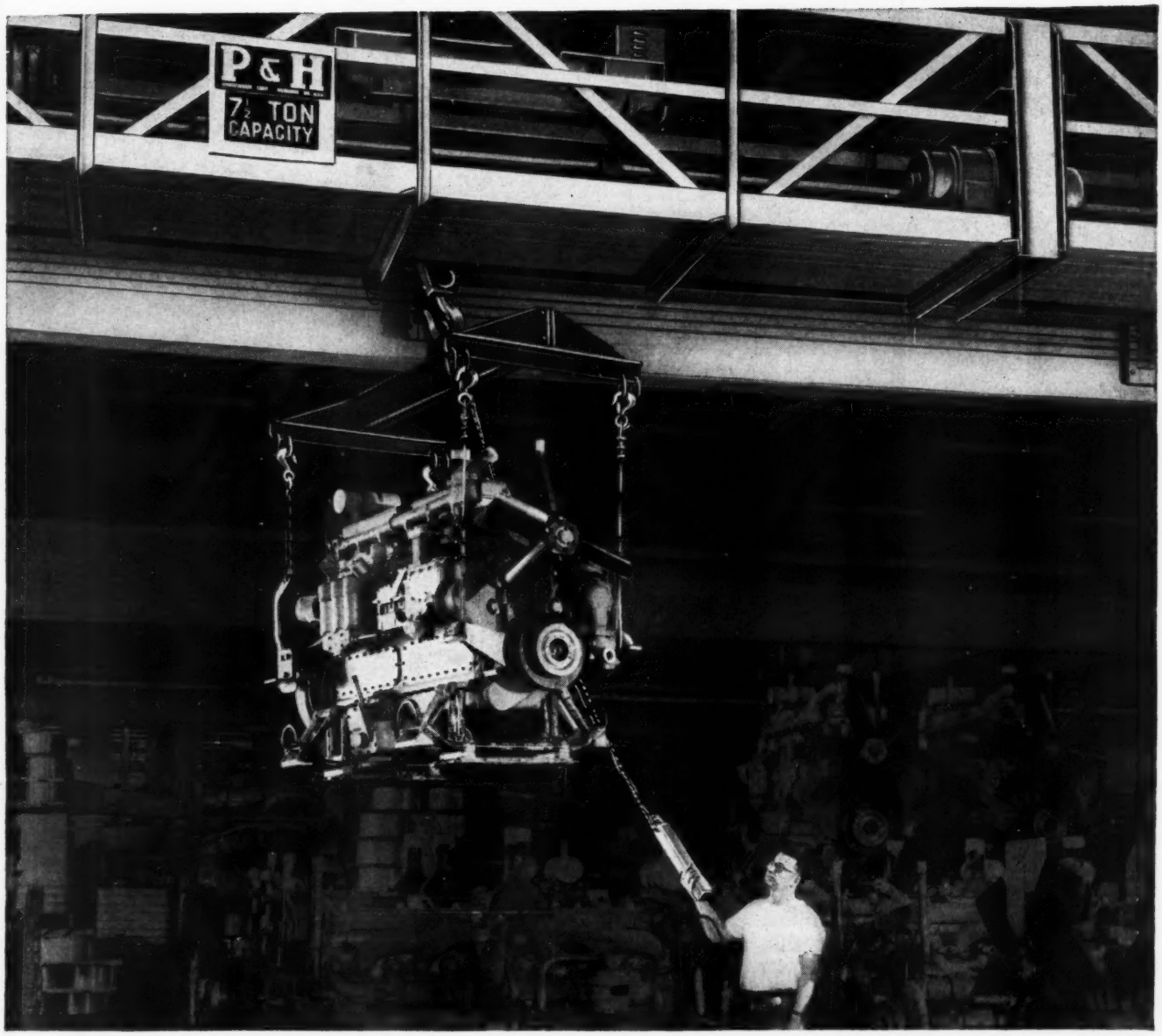
interpreted so as to permit participation by NSPE members who are employed by consulting engineers who may also be constructors, as well as by employees, partners, and principals of consulting engineer firms. However, National Bylaws apply only to operations on the national level. Bylaw 14 of the Missouri Society of Professional Engineers is worded in much the same manner as the National Bylaw. On the other hand, the local section in Kansas City restricts participation in local level activities to members of the Western Chapter who are "... employers, or employees in responsible charge, of consulting engineering firms in private practice."

This clearly exemplifies one of the finest things about NSPE. Each state organization can operate autonomously in matters of state concern. Similarly, chapter groups are perfectly free to act in matters of purely chapter concern. NSPE believes firmly in home rule. Its method of operation is such that grass roots opinion and action carry through effectively to the state and national levels.

It is properly true that our section's actions affecting society policy on any level must be submitted to the Board of Directors at that level. It is also true that all public statements, recommended policy action, or actions affecting any segment of the Society must be processed and released in accordance with regular Society procedure. I do not think that this is a handicap. Lest there may be some conflict of interest between engineers in various fields of practice, I feel that it is best to work these matters out as a unified group in the appropriate Board. Our Boards of Directors on all levels are made up of engineers engaged in many of the various types of engineering activity. This is the place where we should reconcile our differences. Decisions so made bear the full accord and implementation of the entire engineering profession.

Q. What do you think the future will bring in the way of unification?

A. That is a very broad question. To begin with, I believe firmly that we will find the various associations in the CEC and the consulting engineer functional sections of NSPE realizing the need for and benefits of unification. All of us basically desire attainment of the same objectives. It is only logical that we should work as one. The question of unification brings up the very pertinent and worthwhile subject of unification of the major engineering organizations. Recent activities have shown intensified thinking on the subject. If continued, it is my belief that men of reasonable nature will find a workable plan. Details, however important, are relatively minor, and we will find that they will work themselves out in time. Essential to our welfare is unity. We must not let minor difficulties or disagreements stand in our way. ▲▲



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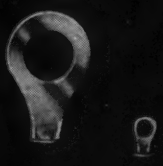

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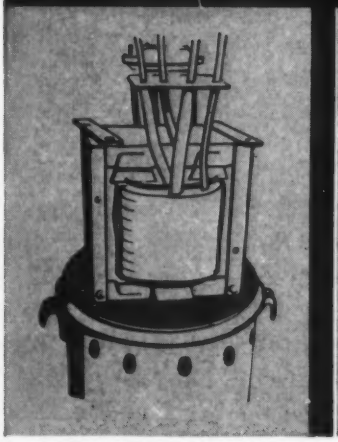

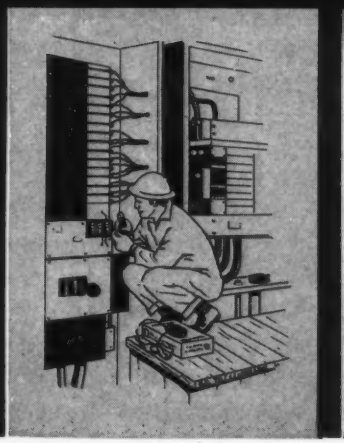

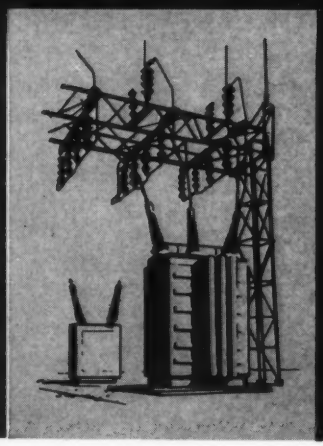

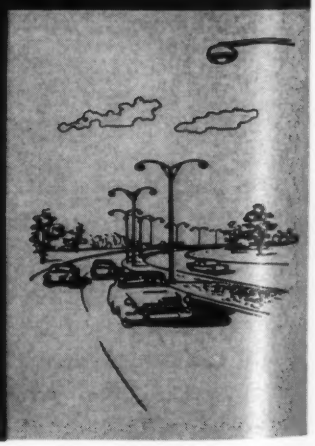

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TERMINAL PRODUCTS UTILITY INDUSTRY...

AMP's diversified lines of terminal and connector products . . . and matched precision-engineered application tooling . . . have been part of the utility industry's components story, in many ways, for many years. These products have been designed for the exacting requirements of the electrical industry in general, and a predominant number of original equipment items depend on the AMP method of termination and connection for service reliability.

AMP's diversified lines of terminal and connector products include:

SOLISTRAND®—of one-piece construction, for application to stranded, solid or irregularly shaped conductors.

DIAMOND GRIP—non-insulated, but having metallic sheath to provide full circumferential support to cable. Excellent for applications where resistance to vibration is a factor.

Ampli-BOND®—provide full insulation support for large wire sizes. They are bonded and reinforced to prevent relaxation of cable support.

PRE-INSULATED DIAMOND GRIP—insulated with tough plastic that won't come off . . . it's bonded. Affords optimum performance under vibration.

Some typical applications of these A-MP products are shown below.

AMP's continuing programs of research and development are increasing the potential of newer products to speed operations, reduce costs, and improve reliability for all phases of utility activity.

A-MP products, when required for maintenance and repair needs, are available in the U. S. A. through American Pamcor Inc. api AMERICAN PAMCOR INC.

For additional information write to:

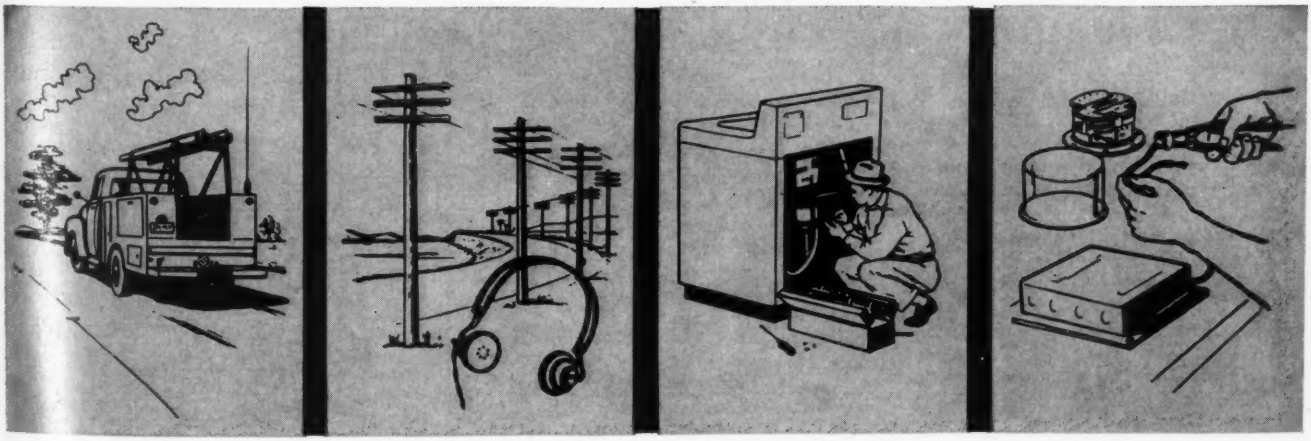
AMP INCORPORATED

General Offices:

7137 Eisenhower Boulevard, Harrisburg, Pa.

Wholly Owned Subsidiaries: Aircraft-Marine Products of Canada, Ltd., Toronto, Canada • Aircraft-Marine Products (Great Britain) Ltd., London, England • Societe AMP de France, Le Pre St. Gervais, Seine, France • AMP—Holland N.V. 's-Hertogenbosch, Holland

Distributor in Japan: Oriental Terminal Products Co., Ltd., Tokyo, Japan



PRE-INSULATED DIAMOND GRIP, DIAMOND GRIP, and SOLISTRAND types find extensive usage in truck and car fleet maintenance.

PRE-INSULATED DIAMOND GRIP Terminals and Connectors for communications equipment.

PRE-INSULATED DIAMOND GRIP, DIAMOND GRIP and SOLISTRAND types for appliance repairs.

PRE-INSULATED DIAMOND GRIP, DIAMOND GRIP and SOLISTRAND types for meter repairs.

Readers' Comment

The CE and Lighting

Sir:

I noted with interest your item in the June 1957 issue, page 37 ("Readers' Guide"), which stated that Mr. Faucett's article on architectural floodlighting will be helpful to the consulting engineer.

Actually, there are very few consulting professional engineers employed in this work. The vast majority of those are given courses sponsored by the light and power companies, fixture manufacturers, and prepared by the National Electric Lamp Association, at Nela Park, Cleveland. Most credit must be given for this research to Nela Park, much of this technology being published in *Illuminating Engineering* magazine, the official organ of the Illuminating Engineering Society.

Most manufacturers of lighting equipment and most power and light companies offer "free" engineering in connection with the promotion of their products.

Very, very few of these lighting specialists are professional engineers, but it must be admitted that most of them are much better qualified in this field than the average P.E. Consequently, there are pitifully few pure illumination consultants who earn their way as professional consulting engineers.

These "specialists" have done a great job making the U.S.A. the best lighted country in the world. The cost has mostly been paid by the lighting manufacturers and the power companies, which, of course, has been passed along the line. Private education, in my opinion, could never have done this job as well.

But why, may I ask, must this one of all the great sciences be so controlled, and what chance has any competent illumination consulting engineer to learn except through this type of sponsorship.

May I suggest that as the first step that such "lighting engineers" be made to qualify legally as professional engineers under state laws. In this state, the registration law permits the offering of engineering services by manufacturers and public utilities "in connection with the sale of their product"—in the case of electric light companies their product is kilowatt-hours. The local Society of Professional Engineers is indifferent. With all this data available from the "specialists," without charge, there is no reason why anyone should hire consulting engineers!

Frederick M. Hill
Professional Engineer
New Haven, Conn.

Most Worthwhile

Sir:

While I am writing you I would like to express my appreciation for the magazine CONSULTING ENGINEER. You are doing an excellent job with the publication and the articles contained therein are

THE PENNSYLVANIA PLAN:

100% financing for your new plant

Complete financing for Lease-Purchase of a new plant is available in labor-surplus areas of Pennsylvania through combined efforts of lending institutions, non-profit community organizations and the Pennsylvania Industrial Development Authority. Interest as low as 2%, with deferred amortization, can be applied on up to one-half of total plant cost.

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100% Financing at a glance . . .
Industrial Plant Construction Costs—

Subscribed by local non-profit community sponsored builder-owner corporations.	*20%*
2nd Mortgage Loan, Pennsylvania Industrial Development Authority.	*30%*
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Total financing, secured through local subscriptions and mortgage loans, without cash investment by the manufacturer.	*100%*

For free copy of "Plant Location Services" pamphlet, or for details on 100% financing, write or call:

Pennsylvania Department of Commerce
Main Capitol Building
917 State Street, Harrisburg, Pa.
Phone: CEdar 4-2912

Behold! My New Name:

SEEMORE

In response to my pleas for a name, many splendid suggestions were presented. After much thoughtful consideration, I have chosen the name "Seemore", submitted by

MR. WILLIAM J. MAGILL
Lighting Consultant
Southern California Edison Co.
P. O. Box 410
Long Beach 1, California

To Mr. Magill, and to the others listed below, whose suggestions were also deemed worthy of reward, I am dispatching a bottle of Metaxa—that most excellent Greek brandy. My warmest thanks to all of you who so kindly assisted in my quest for a name.

MR. A. E. BRUNER
Lighting Specialist
The Electric Supply Co.
128 Walton St., N.W.
Atlanta, Georgia

MR. R. S. SMITH
Consulting Engineer
3230 Ave. "J"
Fort Worth, Texas

MR. JACK PARSONS
Illuminating Engineer
Niagara Mohawk Power Corp.
Buffalo 3, New York

MARY MacD. TRACY
Eaton W. Tarbell & Assoc., Inc.,
Architects
173 Exchange St.
Bangor, Maine

Guth brascolite
THE EDWIN F. GUTH COMPANY
2615 Washington Blvd. • St. Louis 3, Mo.

most appropriate. At the inception of publication of the magazine many consulting engineers in this area questioned the wisdom and the possible success of the magazine, but I believe now all agree that it is most worthwhile.

David B. Benham
Benham Engineering Co.
and Assoc.
Oklahoma City, Okla.

The Greek Knew Too

Sir:

In the article "Applied Mathematics in Ancient Egypt" by Edwin Brown Allen (CE, August 1957, page 64) it is stated that the application of mathematics apparently did not show much advance in Egypt during the Greek periods prior to A.D. 750.

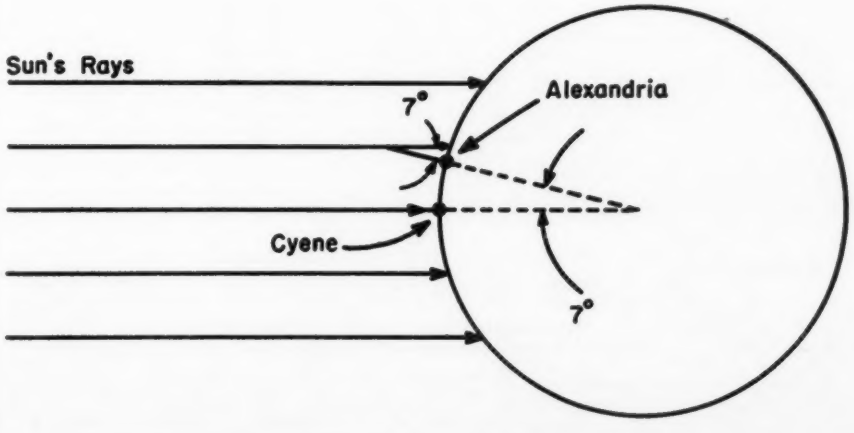
One evidence of the Greek influence in Egyptian mathematics is noted in the calculations of Eratosthenes who was a resident of the Greek colony of Alexandria during the third century B.C. Eratosthenes noted that at Cyene, a village on the upper Nile and apparently very close to the equator, the noon sun was directly overhead during the equinox. This was apparent from the fact that vertical objects threw no shadow on that day. He was also aware that in Alexandria on the same day, the sun passed approximately seven degrees away from the zenith. Eratosthenes postulated that the explanation of the fact must be that the earth was round and that when the sun's rays fell vertically in Cyene, they were bound to strike the earth at a certain angle 5000 Egyptian stadia to the north.

The concept of central angles and corresponding included arcs of the circumference was not unknown at this time, and the parallelism of the sun's rays was accepted by Eratosthenes. The sketch below illustrates his line of thinking.

Since the angle of inclination was approximately 1/50th of a full circle, he deduced that the total circumference of the earth should be 50 times the distance of approximately 5000 Egyptian stadia, and he therefore calculated that the circumference of the earth should be 250,000 stadia. Since one Egyptian stadium is about 1/10th of a mile, his calculations indicated that the circumference of the earth should be approximately 25,000 miles — extremely close to best estimates in modern times.

It is not known to what degree publication of Eratosthenes' calculations were made, but it did take approximately 1800 years before his prediction was confirmed by Columbus' practical expedient of sailing over the horizon and thereby proving to the then modern world that the surface of the earth was indeed a sphere.

It should be noted that the independent thinking of Eratosthenes was, in his time, equivalent to



DURING EQUINOX SUN'S RAYS WERE PERPENDICULAR TO CYENE.

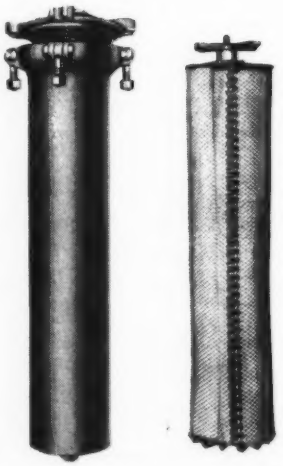
IN THE *Silent Service*

NUGENT FILTERS
protect motor drive bearings aboard the U.S.S. NAUTILUS

On 17 January 1955, the U.S.S. Nautilus, world's first nuclear-powered submarine, made her maiden voyage. Since that historic day, she has traveled well in excess of 60,000 miles. Built as a "true" submarine, by the Electric Boat Division of General Dynamics Corporation, Nautilus has logged the greater portion of her travels while totally submerged.

For duty such as this, both the men and equipment that serve aboard her must be rugged and dependable. We are justly proud that Nugent lube oil filters were selected to provide positive full flow protection for the motor drive bearings aboard the Nautilus. They filter all the lube oil in circulation every cycle before it goes to the bearings, removing harmful impurities before they can reach and damage vital parts.

If your equipment demands the ultimate in filtering protection it will pay you to investigate the advantages Nugent offers. Write for full information.



Nugent bag-type filters Fig. 1116 HA-4L protect motor drive bearings aboard the Nautilus. Filter cartridges are Fig. 1116 CE-4L.

Established 1897

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3460 Cleveland Street Skokie, Illinois

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the conclusions of other great thinkers in their times, such as Fourier, Descartes, Newton, or even our own Einstein and Bohr.

John V. Gebuhr
Brown Engineering Co.
Des Moines, Iowa

Praise from Canada

Sir:

For some time now we have been receiving your magazine CONSULTING ENGINEER and have found it to be an excellent publication for our profession, both from the standpoint of variety in the various articles and as a source of excellent information in conducting a practice.

At a luncheon meeting today of the directors of the Association of Consulting Engineers of Canada we discovered that some of our members unfortunately were not receiving your publication. With the permission of our president, we are attaching herewith an up-to-date list of our membership and would suggest that you check it against your Canadian distribution list.

John H. Ross
John H. Ross and Assoc. Ltd.
Toronto, Canada

And Switzerland

Sir:

When about a year ago I started to receive regularly copies of your publication CONSULTING ENGINEER, I thought, "Well, it's certainly a very interesting magazine, but how am I going to read it on top of the list of other specialized technical magazines, of which I cannot keep abreast?".

Since then, I readily confess, I could less and less resist the temptation of casting aside one or the other of the "traditional" periodicals and devote the time gained in that way to the study of CONSULTING ENGINEER. I have come to appreciate it more and more, and I wish to congratulate you and your staff for the admirably and excitingly edited information continu-

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that squarely meet every LIQUID HANDLING REQUIREMENT

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THESE ARE THE *Pumps*

ASK FOR *FREE* ENGINEERING BULLETINS

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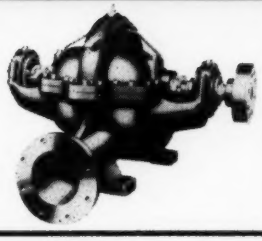
Use these pumps in the widest range of water handling services. Single stage, horizontal split case design. Mechanical shaft seal construction available in sizes up to 4" (Type AS). Heads: up to 300 ft.; capacities up to 70,000 gpm.



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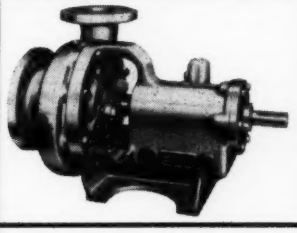
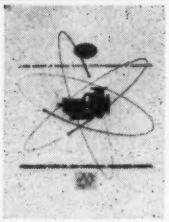
TYPE DL AND DM CHEMICAL PROCESS PUMPS

Combine quality with economy through a practical idea of component interchangeability between pump types. Oil and grease lubricated bearing housings. Packing gland or shaft seal designs. Air or water cooled back plates. Heads to 430 feet; capacities to 800 gpm. Pressures to 400 psig.





Ask FOR BULLETIN B-1608

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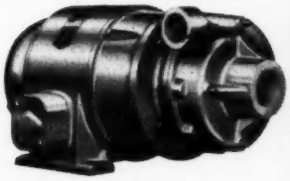
America's broadest line of economical, general purpose pumps. Horsepower range from ¼ to 150. Head range to 260 ft. Capacities up to 5500 gpm. Easy to buy, apply, install and maintain. Tens of thousands in use.



Ask FOR BULLETIN B-2300

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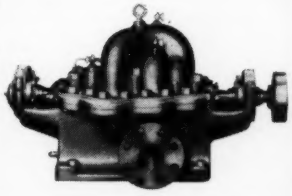
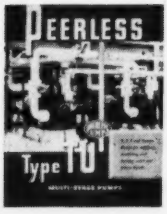
2,3,4 and 5-stage designs for supplying, circulating and boosting water and other liquids in moderate capacities against medium and high heads. Durable and dependable in operation. Heads up to 1660 feet; capacities up to 3000 gpm.





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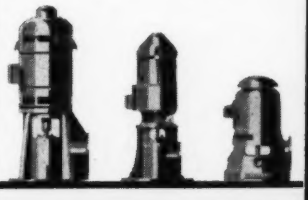
VERTICAL INDUSTRIAL SERVICE PUMPS Heavy duty, extra heavy duty and process service types for application to cooling tower service, tank pumping, etc. One of the proudest lines manufactured. Save on piping, always primed, require minimum floor space. Heads to 1000 feet; capacities: 30 to 40,000 gpm. HP range: up to 2500 h.p.



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FLOOR GRATINGS
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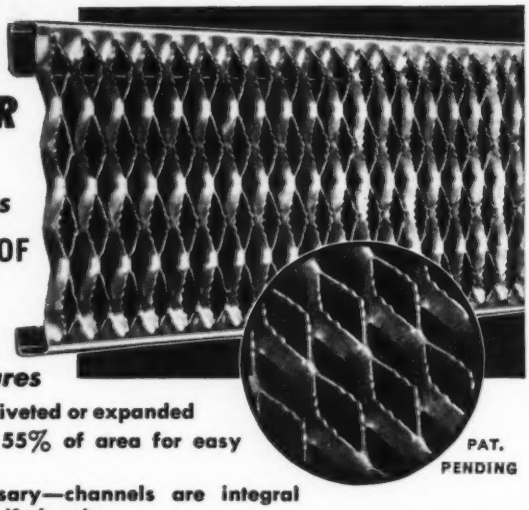
FOR MAXIMUM SAFETY ALL OVER YOUR PLANT



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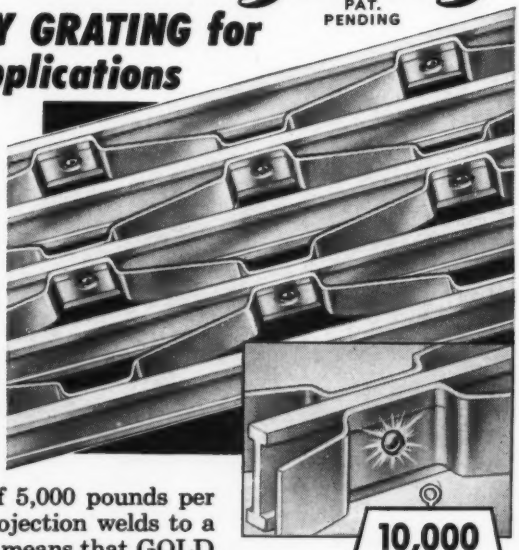

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Each secondary load bar (A), as projected welded to the primary load bar (B) has a shear strength of 5,000 pounds per weld. There are 28 such projection welds to a square foot of grating. This means that GOLD NUGGET Welded Grating can sustain greater shock loads than other gratings.

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ously presented on a high level of professional attitude!

My conscience, although I made some efforts to stretch it, would not allow me to further benefit of your magazine gratuitously, as was the case till now. I would therefore feel grateful if you could do me the favor of instructing your publishing department to send me an invoice for a year's subscription. This would also serve my father, Dr. Jakob Buchi, to whom you have been sending copies at his former address: Bahnhofstrasse 38, Zurich, Switzerland. His subscription can be discontinued, as he has retired from regular active practice, and in any case he will always be able to consult CONSULTING ENGINEER at my office.

Hans F. Buchi
Engineer
Zurich, Switzerland

Interesting and Useful

Sir:

I understand that if a person has certain qualifications he can receive your magazine free. I hope I am right in this assumption, because I recently saw several copies of your magazine and found them extremely interesting and useful . . . I am most anxious to begin reading CONSULTING ENGINEER regularly.

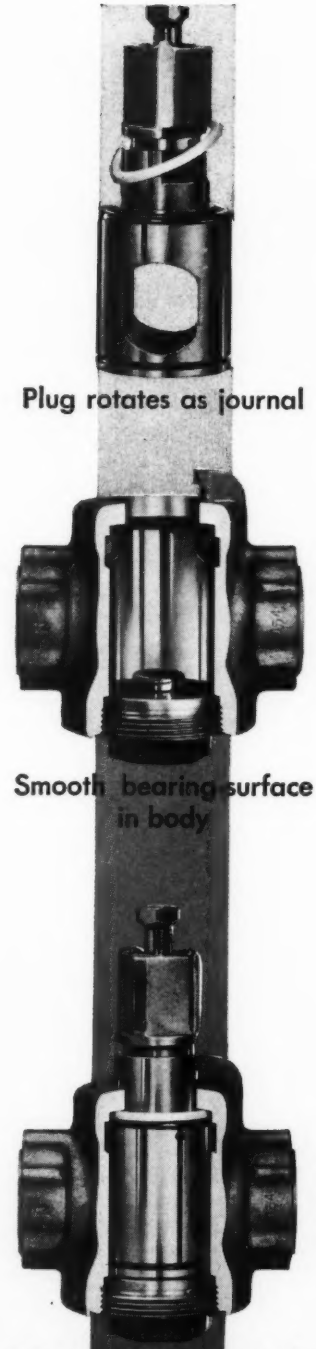
James E. Crockett, Partner
Robert L. Morris Assoc.
Baltimore, Md.

Income Tax

Sir:

Please send 50 copies of reprint "Corporate vs Partnership Income Taxes" (CE, August 1957) . . . We would like to mail them out to members of the Consulting Engineers Association of Michigan. We are sure this article will be of great interest to all our members.

W. B. MacWhirter, Pres.
Consulting Engineers
Association of Michigan
Grand Rapids, Mich



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Sizes: ½" through 30".

Pressures: Semi-steel; 175 lbs. WOG to 500 lbs. WOG. Carbon steel; ASA 150 and ASA 300.

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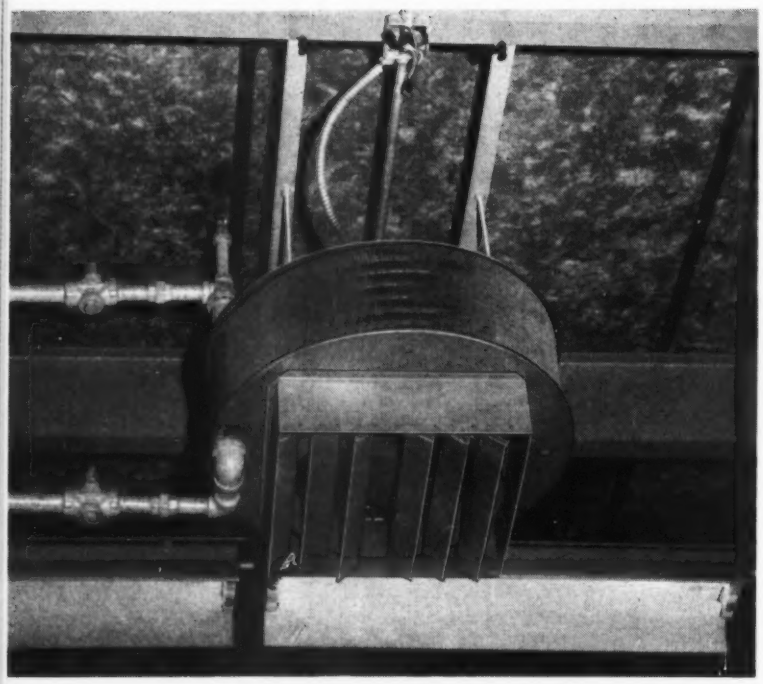
the Herman Nelson **department store** o

ventilating equipment !

From the vast Herman Nelson line, it was easy for Solar A
craft Company to choose just the *right* units, in the *ri*
capacities, needed to solve all heating problems at its hu
Des Moines plant. Solar, with headquarters at San Die
California, is a major supplier of heat resistant alloys to t
aircraft industry. It is typical of the many top-flight manuf
turers that look to Herman Nelson for precision performan
guaranteed results in heating and ventilating.

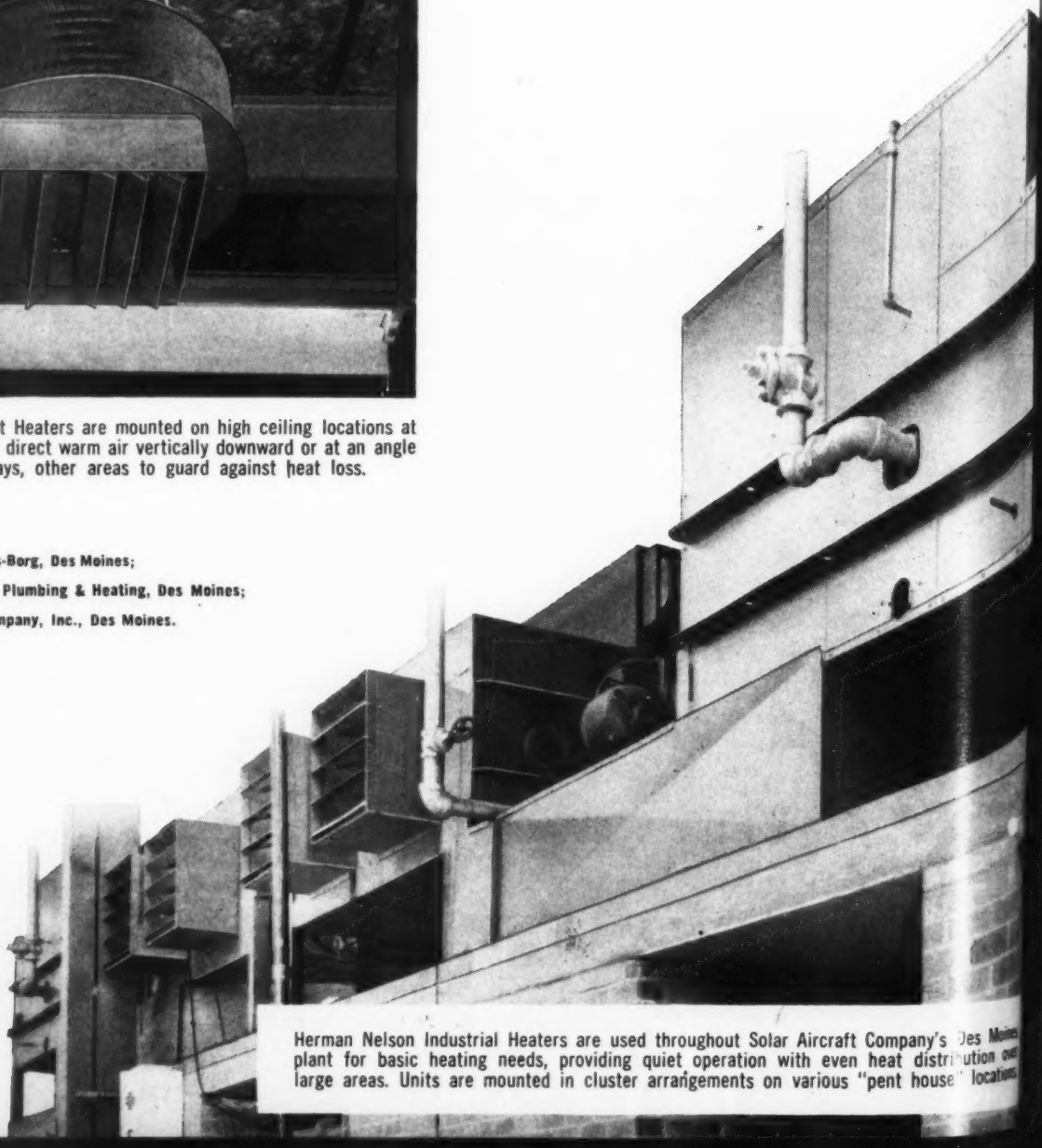


Herman Nelson Vertical Unit Heaters are mounted on high ceiling locations at Solar's Des Moines Plant to direct warm air vertically downward or at an angle near loading docks, doorways, other areas to guard against heat loss.

Architects & Engineers—Brooks-Borg, Des Moines;

Mech. Contractor—M. A. Wolin Plumbing & Heating, Des Moines;

Gen. Contractor—The Weitz Company, Inc., Des Moines.



Herman Nelson Industrial Heaters are used throughout Solar Aircraft Company's Des Moines plant for basic heating needs, providing quiet operation with even heat distribution over large areas. Units are mounted in cluster arrangements on various "pent house" locations.

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Company, Inc.

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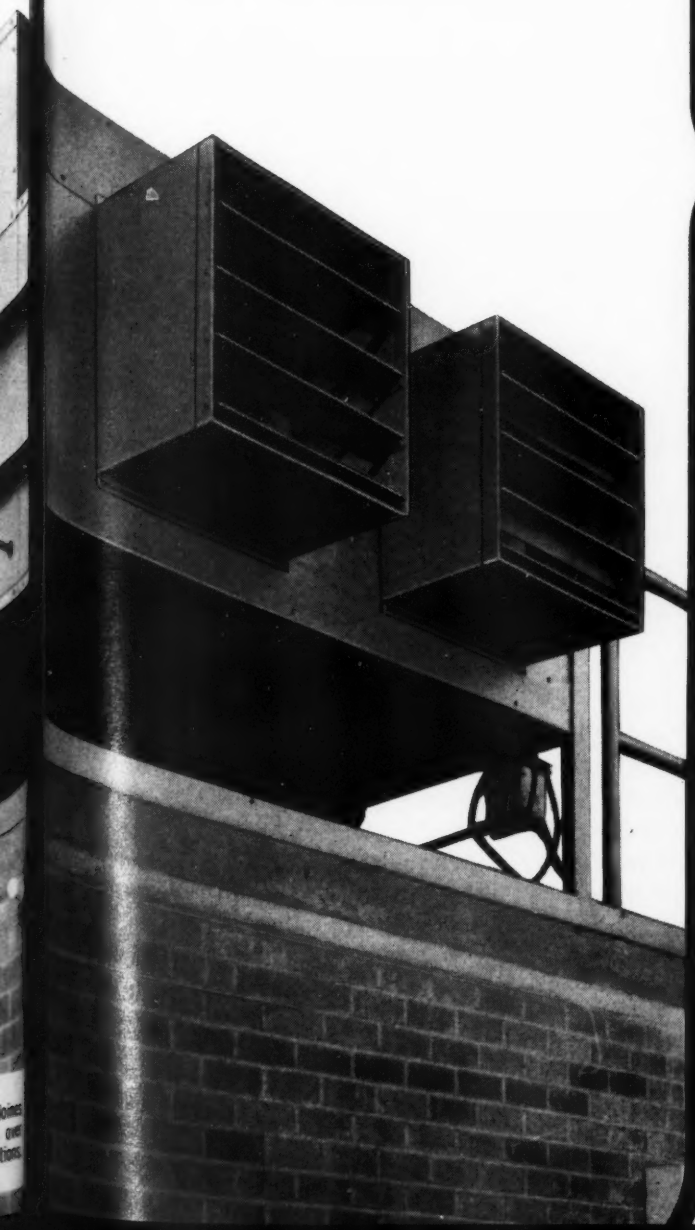
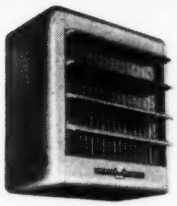
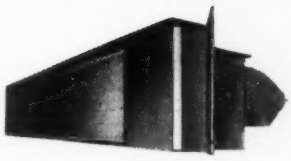


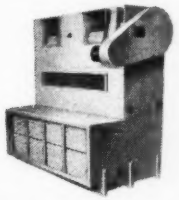


Horizontal Unit Heater Available in 18 sizes, designed for ceiling suspension and also to use either steam or hot water. Quiet operation; compact design. Catalog No. 700.

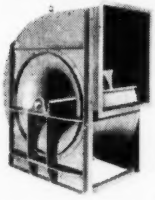


Roll-O-Vent Air handling units that change their own filters automatically. Media loads like a camera, lasts up to a year. Catalog No. 780A.

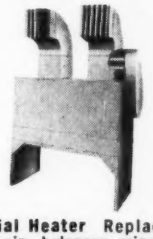
Vertical Unit Heater For high ceiling installations. Discharges air vertically downward or at angle to vertical in various directions. Steam or hot water. Catalog No. 700.



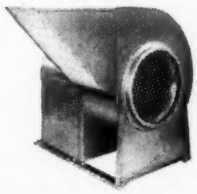
Air Conditioning Unit New type air-conditioning units for low cost commercial and industrial applications. Delivers up to 15,000 cu. ft. clean, cooled air per min. Catalog No. 785.



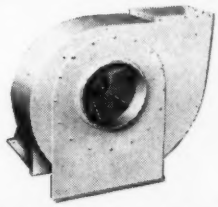
Centrifugal Fan Available in either slow speed or non-overloading types; 17 wheel diameters from 12¼" to 73"; 8 arrangements for direct or belt drive. Catalog No. 850.



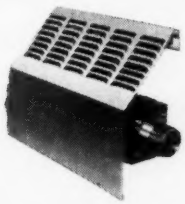
Industrial Heater Replaces exhausted air, balances minus pressures. Big capacity – does the job of many smaller, propeller-type units. Catalog No. 750.



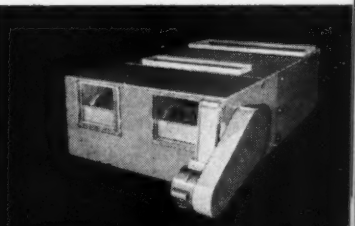
Unit Blower Years-ahead features in new "packaged" Unit Blowers. Compact, spacesaving, easy to service. Wide range of unit sizes. Catalog No. 826.



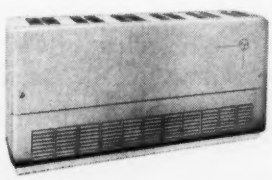
Industrial Exhauster Exclusive hub assembly cuts maintenance & replacement costs. New impeller design; heavy duty shaft & bearings. Catalog No. 860.



Finned Radiation Available steel fins on steel tubing or aluminum fins on copper tubing. Light-weight, suitable for exposed or concealed installation. Catalog No. 790.



Heating & Ventilating Unit Hangs on ceiling, out of the way, or mounts on wall or floor. Quiet operation, slow speed, with completely rotable fan sections. Catalog No. 775.



Console Heater 16 models – 64 air inlet-outlet arrangements. Fully-recessed, semi-recessed or free-standing applications. Smartly designed. Catalog No. 727.

Propeller Fan Operates horizontally or vertically; belt or direct drive. Wide range of sizes in both types. Capacities to 36,150 CFM. Low operating cost. Catalog No. 800.

Scraps & Shavings

CONSULTING ENGINEER magazine has never considered the private practice of engineering to be a profession hemmed in by national boundaries. Our Canadian circulation has been continually increasing, the magazine now going to all the members of the Association of Consulting Engineers of Canada. We also have some European circulation — not great in numbers, but important in that it goes to the officers of the ten National Associations that are affiliated in the International Federation of Consulting Engineers. We also keep the magazine going to all of our American subscribers who are working on projects outside our borders.

Despite the small number of copies going to Europe, there is every reason to believe that the publication is being well read by the engineers who get it. We get an astounding amount of foreign mail, long letters from European consulting engineers who are interested in the way the profession is practiced in this country. These letters as well as our personal contacts with European engineers confirm our conviction that engineers in private practice the world over are much alike. There is no real difference in the ethical standards or the technical proficiency of engineers in Copenhagen, Kansas City, or Quebec. There are good engineers in all parts of the world and a few incompetents everywhere.

Because consulting engineers have so much in common and because they have so much to learn from each other, it is only logical that they should have some meeting ground. Ultimately, we think, the Consulting Engineers Council will become a part of the International Federation of Consulting Engineers, but at this moment the Council is not ready to apply for admission, for it has by no means consolidated its position in this country. Furthermore FIDIC is not yet ready to invite the Council into membership. Preliminary feelers are just now being put out by parties on both sides. It is interesting to note, however, that an officer of FIDIC has asked to be put on the mailing list for Council newsletters and the newsletters of the several state and regional associations. Officers of the Council also have started a correspodence with several engineers high in FIDIC. These slight indications of interest have no real meaning except that they are always necessary before even the most preliminary negotiations can take place.

Actually, there is still considerable distrust on both sides of the Atlantic. Many Americans cannot see that there is much to be gained by any affiliation with "foreigners." Many Europeans feel that they could only lose by having "Yankees" in their Association, trying, as usual, to run everything by talking loudest and throwing their weight around. While both of these attitudes are wrong and are based on misconception, they have many proponents and raise doubts even among the informed.

The fact is that so far as the Europeans are concerned (particularly the British) the Association of Consulting Engineers of Canada perhaps is closer to affiliation with FIDIC than is the Consulting Engineers Council. Add this to the close relationship of Canada and the U.S., and an international unity approach is suggested. Why should not the Association of Consulting Engineers of Canada and the Consulting Engineers Council find a means of getting together? The Canadian Association is set up very much like the state and regional associations in the United States. The Council is not in itself an association but a federation of Associations, each maintaining its own full authority and sovereignty.

In order that Canada might be given a fair representation, a scheme could be worked out whereby Canada had representation on the Council through provincial directors just as there are state and regional directors from this country.

Everyone would gain by the affiliation. The Council would be strengthened and the Canadian Association would gain strong allies. Together they would be in a better position to deal collectively for eventual admission to the International Federation.

We would strongly recommend to President Wolff, of the Council, that he or some of his Executive Committee see if they can arrange to meet with the directors of the Association of Consulting Engineers of Canada to probe this matter and determine what action would be mutually agreeable. A united front on this side of the Atlantic would be the logical first step toward an organization that would represent the business and professional interest of reputable and qualified consulting engineers around the world.

The Word *from* Washington

EDGAR A. POE
Consulting Engineer Correspondent

PEACETIME potentials of nuclear energy are so tremendous that greater legislature interest is being focused on the atom. Congress appropriated $2.3 billion to carry out the Atomic Energy Commission program during the 1958 fiscal year. This means that there will be a marked step-up in nuclear power research.

Government authorities are predicting that the years ahead will see nuclear power propelling railroads, airplanes, and ships. The Navy is preparing to build a huge carrier, to be powered by eight reactors, costing $314 million. The Navy also has placed in operation its fourth atomic submarine and plans to build a big new submarine that will fire guided missiles.

Meantime, the Maritime Administration said the building of the first nuclear-powered merchant ships appears to be not too distant. Engineers and shipping industry representatives generally agree with the prediction, which grew out of a Maritime Administration-sponsored conference.

Experts in the Nation's Capital are insisting that further technological improvements will have to be made before nuclear power can become commercially feasible in this country. Unlike Britain, which has little in the way of natural resources, the United States has an abundance of oil, gas, coal, and falling waters.

Chairman Carl T. Durham of the Joint Congressional Atomic Energy Committee, maintains that atomic energy development has become a part of our foreign policy. Although the U.S. is leading in reactor technology, the North Carolina Democrat contends this country is being challenged seriously in large-scale development by Britain and the Soviet Union.

Chairman Durham expressed the conviction that after the immediate acceleration problems are taken care of, the Joint Committee should sponsor the development of a 10-year demonstration power reactor program. He suggested the possibility that the 10-year program would begin where the five-year experiment reactor program leaves off.

"It should provide", he said, "a long-term assurance to private atomic equipment companies and private and public power organizations of a stable and steady amount of government financial support and assistance for atomic power development during this development period for private industry."

Senator Clinton P. Anderson, vice chairman of the Joint Committee, one of the most enthusiastic backers of nuclear energy research, said: "Present discoveries promise health and wealth and an ease of living beyond calculation. They hint of a dazzling array of day-to-day advances, travel out among the stars, push-button weather and even eternal life." Senator Anderson did not specify whether the "eternal life" would be here or elsewhere.

THE Bureau of Public Roads says there has been no apparent change in the number of engineers employed by the 48 state highway departments since early 1956. The last state-by-state survey report showed 20,600 engineers, and 25,900 engineering aids and technicians.

To aid in alleviating the shortage, more and more consulting engineers are being employed by the highway departments, according to the American Road Builders Association.

THE Department of Defense is the latest to conduct a survey of engineering and scientific salaries. To its thousands of engineers and scientists, the Navy and Air Force plan to pay salaries at the maximum of each grade through GS-15. The Average GS-15 salary is about $11,800. Grade 18, the top government civil service bracket, carries an annual salary of $16,000.

A SENATE-passed TVA proposal to permit that Government corporation to issue up to $750 million of self-liquidating bonds was deliberately sidetracked by sponsors in the House of Representatives with the hope they will find "a more favorable climate" when Congress reconvenes in January. Under this Senate bill TVA also would be permitted to provide engineering design service for private industry in the TVA territory in competition with private consulting engineers.

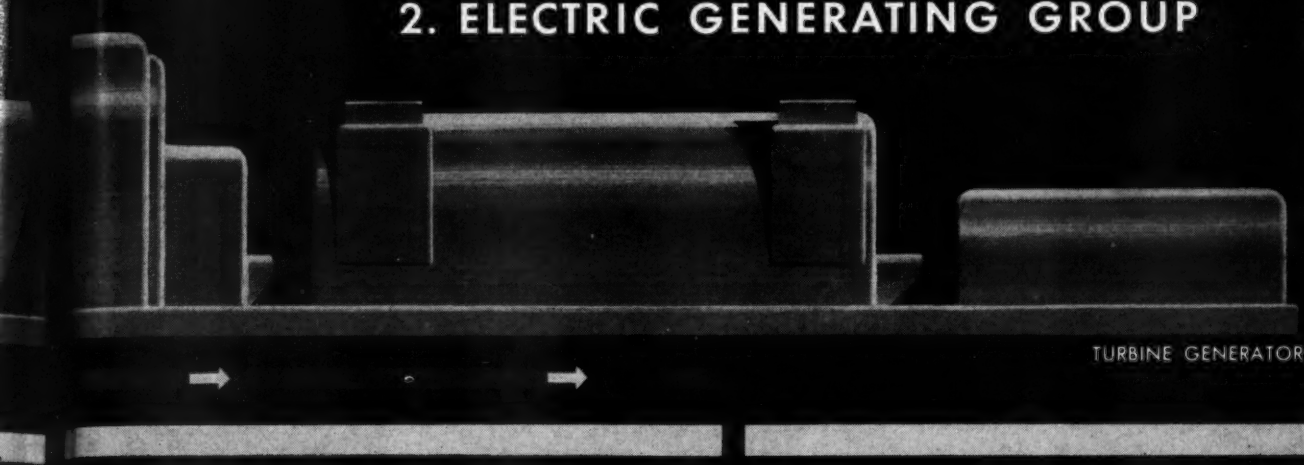
A TOTAL of 650,000 parcels of land will be acquired for the 41,000 mile Interstate Highway System. Each mile of the system will require purchase about 60 acres.

Look at all three

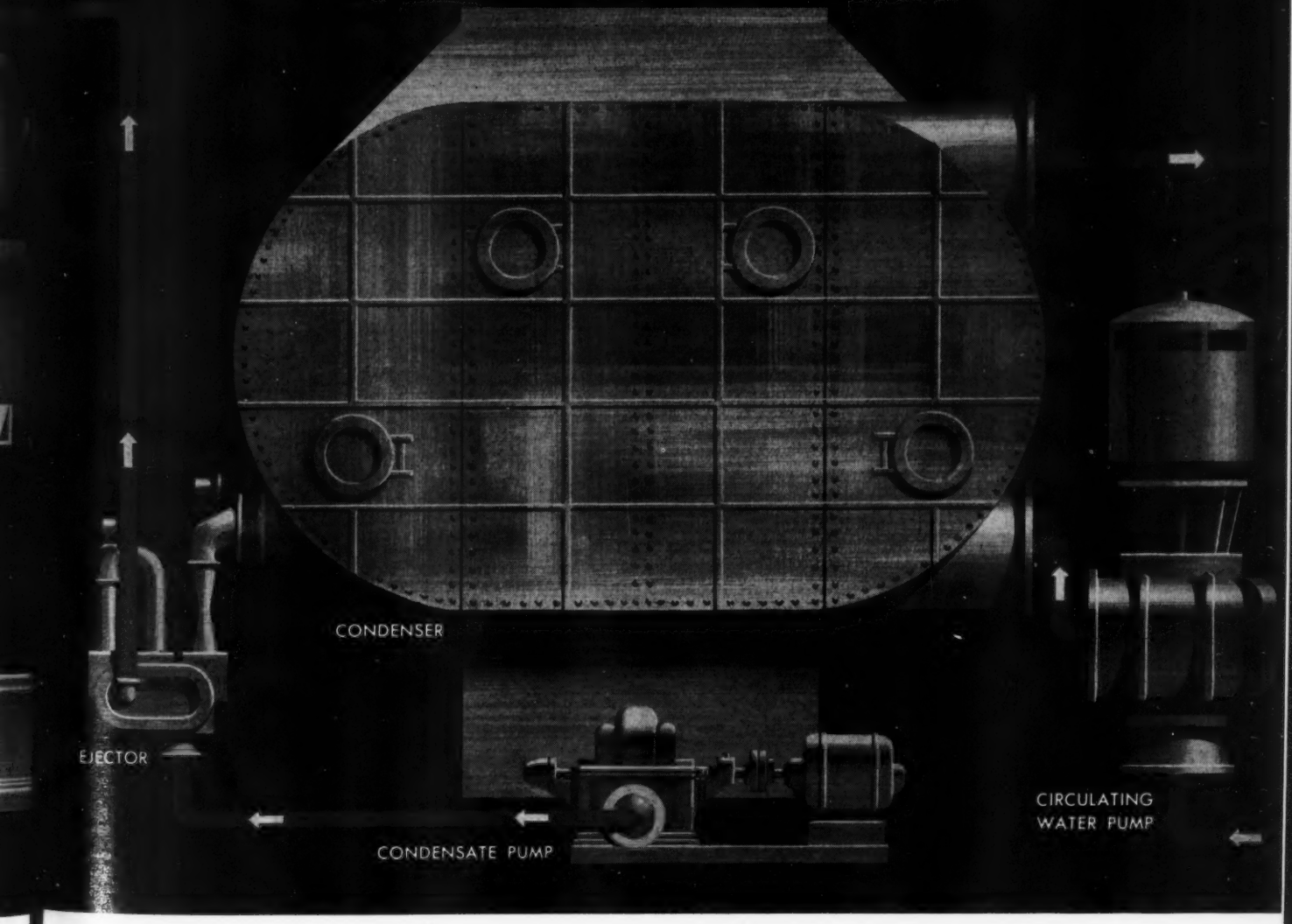
A new steam station design approach is bringing higher efficiencies, lower costs, and greater reliability. In this approach, only three basic functions are considered: (1) Steam Generating, (2) Electric Generating. (3) Fluid Handling. Station requirements are first analyzed in terms of the over-all job performed by each of these groups rather than by each individual piece of equipment.

Many of the benefits of this approach occur in the Fluid Handling Group. Here coordination and integration of the wide variety of equipment used can often effect substantial improvement in over-all operation. As steam temperatures and pressures go up, there are increased demands on the fluid handling function. Plant reliability often depends on the effect of one component of the fluid handling group on another during operational transients, either planned or of emergency nature. The solution is coordinated equipment

2. ELECTRIC GENERATING GROUP



3. FLUID HANDLING GROUP



efor power!

selection, engineering and design. And Worthington's "system" know-how and experience with modern complex plant cycles can help solve your fluid handling problems.

System-wise experience As the manufacturer of all major components of the Fluid Handling Group, Worthington has a reservoir of experience and knowledge that can be of benefit to you. To put this "system-wise" experience to work for you, get in touch with your nearest district office. Or write to section C-71, Worthington Corporation, Harrison, New Jersey.

WORTHINGTON

The Reader's Guide

"Sweet Milk of Concord"

Action in behalf of engineering unity is like lumbago; it has a tendency to reoccur. To select a more sympathetic simile, it blooms in the fall like chrysanthemums. This is because the hierarchy of the great engineering societies changes at this time of year. The retiring executive committees have seen a lot of each other, especially the presidents, who have sat together in Engineers Joint Council and on joint committees. During their year in office these men discover that their societies have much in common — that unity makes sense. This understanding buds in the spring and flowers in the autumn — then dies as the old officers go out, and the new ones come in. The permanent employees of the societies, instead of nourishing the plant, treat it as a weed to be rooted-out or stamped down wherever it rises. But unity has flourished this season. It came to bud earlier and is flowering now as seldom before. Mr. M. S. Coover, recently president of the American Institute of Electrical Engineers, can be given much of the credit, for it is he who published a plan which would seem to fit all groups into their proper places. It brings together and then assigns spheres of operation to EJC, ECPD, and NSPE. It is a good plan. In this issue, on page 78, another prominent engineer much involved in unity activities gives his opinions of it. Morris D. Hooven knows what he is talking about, and we strongly recommend that you read what he has to say in his short but thoughtful article, "Can We Be Put Back Together Again?" Some day we may have unity in full bloom all year-round.

Tilt

Tilt-up construction is a nice compromise between precast and cast-in-place concrete. Where it is applicable, it combines the advantages of both. We might say that tilt-up is "cast-almost-in-place" construction. It seems to have a special affinity for the West Coast, for while it has been seen elsewhere, it is most frequently and most splendidly represented by the specimens found in California. In the rest of the country there is still something of a tradition holding that buildings should start at ground level or below and be built upward. The West Coast is not so inhibited. To them there is nothing undignified about a wall that starts off flat on its face on the ground. The accomplishments of the engineers who have favored tilt-up construction should be studied by other engineers. Two of tilt-up's most prominent proponents are Samuel Hobbs and F. Thomas Collins, both consulting engineers in California. Together they explain the design methods they use and show some examples of their work in "Tips on Tilt-Up Construction," page 80.

Organic Coatings

Specifying paint is a complicated engineering problem. No longer can the responsible engineer specify that exposed metal be covered with "good quality red lead." This has become another field requiring detailed technical knowledge before adequate specifications can be written. Furthermore, it requires a little knowledge of chemistry, which most engineers ignore as being too closely related to alchemy. This new knowledge of protective coatings and the development of new types of primers and pigments does not mean that only a chemical engineer can specify paint to cover a water tank, but it does mean that consulting engineers need to learn more about modern coating materials and spend more time with the paint manufacturer's sales representative. To give you some idea of what is involved, Allen L. Alexander, a well known expert in protective coatings, has written an excellent article which we have entitled (with considerable lack of originality) "How to Specify Organic Coatings." It will tell you a lot you do not know about paint. It starts on page 86.

Engineer-Manufacturer Relations

Speaking of salesmen, it is probable that the average consulting engineer spends more time talking to sales representatives than he does talking to his wife. But this is not always a love affair. The average consulting engineer seems to have a host of specific objections to the way manufacturers' sales representatives go about selling him their wares. The salesman, they think, could do a better job if he knew exactly what the consulting engineer does and how he does it. And since the salesman is the liaison between the manufacturer and the engineer, relations between engineer and manufacturer could be bettered if sales techniques were improved. To find out just what the situation is, we questioned CONSULTING ENGINEER's Committee of One-Hundred—a group of one-hundred engineers from all sizes and types of firms, located in every part of the country. We found out from these men what they thought about the way manufacturers and their salesmen try to sell consulting engineers. If you will read the article "How to Improve Engineer-Manufacturer Relations" on page 96, you can find out whether you agree with the opinions of the Committee, and you can compare your practices and experiences with those of other engineers in private practice. Since this article contains a lot of advice for the manufacturers and their salesmen, advice from consulting engineers, we intend to reprint it and distribute it where it will do the most good — among the manufacturers, themselves. When they find out what it is consulting engineers want from them, perhaps they will provide it. Manufacturers have already ordered 12,500 reprints of the specifications article, published in July, based on the first topic put before the Committee of One-Hundred. This second topic should be even more popular.

Quiet

A good piece of advice for the consulting engineer is, "Keep your big mouth shut until you are paid to open it." The reason for this is that you are just as libel for bad advice given free as you are for errors made on jobs you are paid for. This is a very old and well established interpretation of the law. Albert Woodruff Gray goes into this in his article, "Giving Free Advice Can Cost You Plenty," on page 104. Read it and forever hold your tongue.

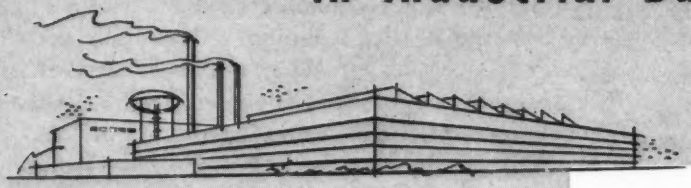
Abraham Lincoln — Engineer

American statesmen seem to have a weakness for surveying. Look back into the early life of our great men and you find not only the worn copy of *Blackstone,* but for some reason, a transit as well. It is not surprising, then, to learn that Abraham Lincoln was a surveyor, and spent several years so engaged. On the other hand, it is a surprise to find that he not only had an intense interest in mechanics but actually holds patent No. 6469, a device for lifting vessels over shoals. He had good cause for working on this invention, for it appears that he seldom boarded a ship that it did not get stuck in some shallows or drag on some dam. Walt Whitman did not know how nearly literal his words might be applied when he wrote of Lincoln, "O, captain! my captain! our fearful trip is done." Fortunately for the nation, Lincoln's invention was never commercially successful, and he went on to law and politics. But he never lost his interest in applied science, and even during his presidency he spent much of his time and thought on the improvement of ordnance and the development of technology. This is a side of Lincoln seldom suspected. Most engineers do not know that Lincoln not only had an aptitude for, but some experience in, both civil and military engineering. Earl C. Kubicek's biographical piece, "The Engineering Mind of Abraham Lincoln," starts on page 108.

Reply From Sweden

For a pertinent commentary this month, you should note especially the report from abroad, "A Reply from Sweden." The president of the Swedish Association of Consulting Engineers, Valter Furuskog, read the "Report from Sweden" we published in July, and he has written an excellent piece elaborating on the earlier "Report" and correcting a few misrepresentations. Particularly he wants us to know that while the "kitchen sink engineer" and the "Sundowner" do operate in Sweden, they are far from loved by the true engineer in private practice. See page 123.

For Permanent
FIRE PROTECTION
in Industrial Buildings . . . .



These ALLENCO Fieldmen helped on these recent installations

Where	What	Specifier	Installer	Allenco Fieldman
Los Angeles, Cal.	Ramo-Wooldridge Corp.	Albert C. Martin & Assoc.	Rockwood Sprinkler Co.	Lang Pratt
Glendale, Ariz.	Salt River Power Co.	Bechtel Corp.	Bechtel Corp.	Lang Pratt
Boron, Calif.	Pacific Coast Borax Company	Southwestern Engr. Company	Forgeron Plumbing Company	Lang Pratt
Wilmington, Cal.	Vegetable Oil Products	Engineering Dept.	Rigoli Company	Lang Pratt
Anaheim, Cal.	Moore Business Forms	Albert C. Martin & Assoc.	Curtis Automatic Sprinkler Co.	Lang Pratt
Los Angeles, Cal.	Pepsi-Cola Bottling Company	Albert C. Martin & Assoc.	California Viking Sprinkler Co.	Lang Pratt
Campbells, Ind.	Indianapolis Power & Light Company—Generating Plant	Themselves	Themselves	Don Davisson
Tulsa, Okla.	Jones & Laughlin Steel Corp.	H. Lyman Cauvel	W. F. Glenn Plumbing Company	Floyd Merryman
Bartlesville, Okla.	Phillips "66" Proving Station Project	Phillips Engr. Dept.	Carl Moore Co.	Floyd Merryman
Riverdale, Ill.	Acme Steel Company	Schmidt, Garden & Erikson	La Salle Construction Company	M. Jepsen
Indianapolis, Ind.	General Motors Corp. —Allison Division	Argonaut Realty Div., Gen. Motors Corp.	Daniel J. Keating Company	George Fee
Athens, Texas	Olive Myers Plant	Giffels & Vallet, Inc., Arch.—C. Cleasman, Engineer	Wm. H. LaDew	Hugh Cunningham
Dallas, Texas	Goodyear Rubber Plant	Harold A. Berry, Arch. and Engr.	Wm. H. LaDew	Hugh Cunningham
Ransonville, Mich.	Ford Motor Company	Giffels & Vallet, Inc. L. Rossetti	John E. Green P & H Company	Russ Collins
Middletown, Conn.	Canal Project, United Aircraft Corp. Atomic Eng. Plant	Chas. T. Main, Inc.	Fred Raff, Inc.	Harold Jope
Wethersfield, Conn.	State of Connecticut, Highway Office Bldg. & Garage	Hubbard, Lawless & Blakeley	Buckingham-Routh	Harold Jope

Lang Pratt

Don Davisson

F. Merryman

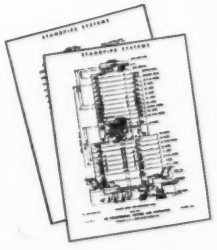
M. Jepsen

Geo. Fee

H. Cunningham

Russ Collins

Harold Jope



Write for model layouts of standpipe systems for various structure-types and services . . .

For prompt, qualified, personal help on any interior fire protection questions, call in your ALLENCO fieldman. Check your classified phone directory or write or phone our Home Office.

. . . .Architects, Engineers and Contractors prefer ALLENCO

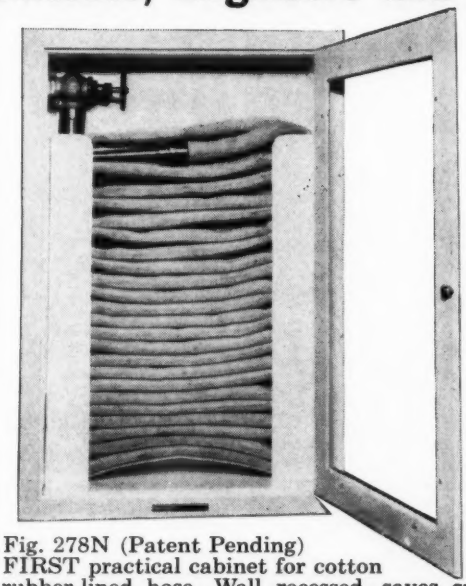


Fig. 278N (Patent Pending)
FIRST practical cabinet for cotton rubber-lined hose. Wall recessed, saves space; fully enclosed, resists attack by fumes, dust, etc. Cradles hose in soft folds, ready for instant use. Several models, sizes and hose-lengths.

Fig. 7153 (listed and approved by Associated Factory Mutual Insurance Companies)—UNIQUE form of major fire hose cabinet, ideal for smaller structures. Steel cabinet no bigger than phonograph record album holds 30-40-50-75 feet of fire type hose. Recessed or wall hung.

Of the many distinct ALLENCO *products and models, these are most widely specified and installed in the industrial field*

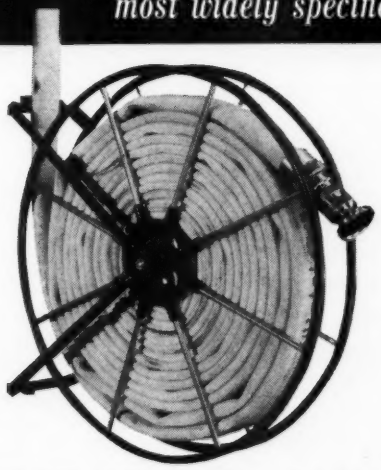


Fig. 145 (UL and FM listed and approved)—Ryerson swinging hose reel with wall brackets or pipe clamps. Holds 50-100-150 feet of cotton rubber-lined hose out of way, yet swings and feeds instantly. To suit type, size and length of hose required.

Fig. 7170 (Patent Pending)—"Hozegard" reel combines protection with fastest way to get full pressure at nozzle in use. Best for linen or light-weight CRL hose, 50-75-100 feet in length, up to 1½" size. Adds years to hose life, fights fire faster.

ALLENCO **W. D. ALLEN** MANUFACTURING CO.
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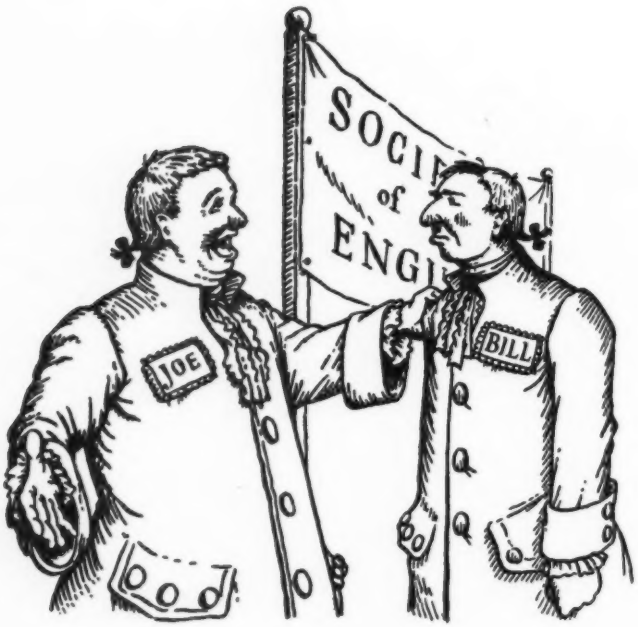


Heard Around Headquarters

STAFF

Working toward the future incorporation of Engineers Joint Council, the EJC board and constitution and bylaws committee have been meeting with legal counsel to draw a revised Statement of Purposes.

EJC will gain several advantages through incorporation. The new status would limit their legal liability, making it impossible to sue member organizations through the EJC. It also would clear the way for a new tax classification, as a nonprofit corporation.

The attorney's original draft included a suggestion that EJC "conduct research or studies in the various fields of the sciences of engineering." This was deleted on the basis that it sounded too much like a technical society. The first draft also said EJC would, in the interest of spreading knowledge, "publish and distribute books, periodicals, and reports of scientific data and technical data." This suggestion also was not carried into future drafts.

Walter E. Lobo, executive committee and board member representing AIChE, presented a memorandum to the board saying that in his opinion, the majority of the constitution and bylaws committee is willing to approve the new statement of purposes on the basis that it would be used solely in the incorporation procedure and would not dictate the future course of action of EJC.

If there is any possibility that the new statement later would necessitate revision of the constitution and bylaws, Lobo said he wished to come out strongly against it.

Lobo asked a number of questions:

¶ If ECPD came out with the same tax classification EJC now has, would EJC want to be in a different tax class?

¶ Can NSPE ever join ECPD if the latter were classed as tax-exempt?

¶ Could NSPE ever join EJC if it were classed as nonprofit?

¶ Does a nonprofit classification really jeopardize United Engineering Trustees' classification or that of the member societies?

"There is divided opinion on this subject," Lobo said. "But my feeling is that we want to look before we leap. We want to know now what the next step will have to be and what it will mean. If all we are playing with now is words, then I shall vote for the suggested statement of purpose, but if its adoption will mean soul searching later, I vote that we do that now."

The proposed statement of purposes sent to the board set forth EJC's objectives:

¶ To advance the general welfare of mankind through the available resources and creative ability of the engineering profession.

¶ To promote cooperation among the various branches of the engineering profession for the general welfare of mankind.

¶ To advance the art and science of engineering.

¶ To develop recommendations regarding public policies respecting national and international affairs in which the application of the art and science of engineering will contribute to the general welfare of mankind.

¶ To secure the more efficient utilization of the scientific and technical abilities and potentialities of the various fields of the art and science of engineering, and the engineers engaged in those fields, to the end that they may effectively serve the welfare of the nation during times of peace and the defense of the nation in time of war.

¶ To conduct research or studies in the various fields of the art and science of engineering.

¶ To receive, own, and maintain funds of real or personal property, or both, and to sue and apply

COLOR-PORT

water level gage

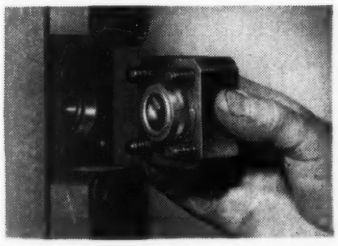
gives you . . . two-color readings
. . . low maintenance
. . . increased availability

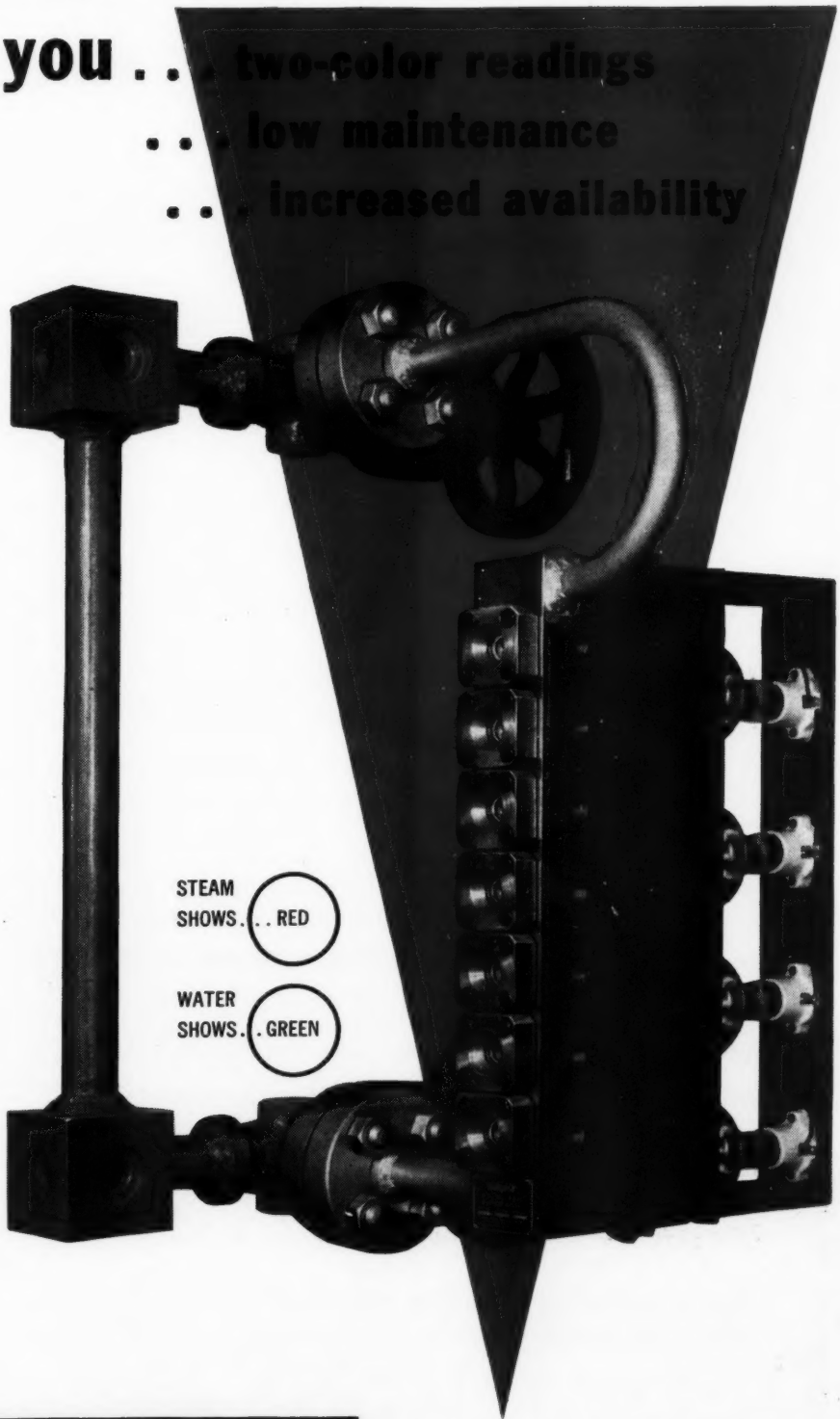
You get a *triple advantage* with the Yarway COLOR-PORT boiler water level gage for pressures to 3000 psi.

Two-color readings are brilliant and clear. Water shows green; steam shows red. A full gage is all green and an empty gage all red.

Low maintenance with individual cover-glass assemblies, each held solidly in place by four socket head cap screws. "Floating assembly" design applies safe, predetermined loads on glass ports, reducing thermal shocks, permitting faster warm-up.

Increased availability means longer service life. Cover glass assemblies can be *serviced in place*, easily and quickly.





Yarway Bulletin WG-1814 describes the Color-Port Gage. Write for it.

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108 Mermaid Avenue
Philadelphia 18, Pa.
Branch Offices in Principal Cities

YARWAY COLOR-PORT

. . . a good way to specify high pressure water gages

the whole or any part of the income therefrom, and the principal thereof exclusively for scientific or educational purposes in the various fields of the art and science of engineering.

¶ To contribute funds of real or personal property, or both, to organizations duly authorized to carry on exclusively scientific or educational activities in the various fields of the art and science of engineering.

¶ To promote the unrestricted dissemination of knowledge and information by means of meetings and publications relating to the various fields of the art and science of engineering.

¶ To do all things necessary or proper in connection with or incidental to the foregoing purposes.

Lobo's memo recalled that "EJC was formed to promote cooperation among the branches and to advance the profession of engineering. These objectives are not set down in the proposal."

The AIEE has protested against the EJC endorsing a "Medic"-type television program based on the engineering profession.

AIEE objection was based on the opinion that such a project would be outside EJC's scope of activity.

An independent television producer had suggested that the EJC act as a clearing house to refer subject material to the proper EJC member group. The program was scheduled for discussion at the Sept. 13th EJC board meeting.

An EJC air pollution statement was presented to the board at the last meeting.

The statement, designed as a broad gage guide for municipal and legislative groups, defines in general terms what constitutes pollution. It does not go into technical aspects of the problem.

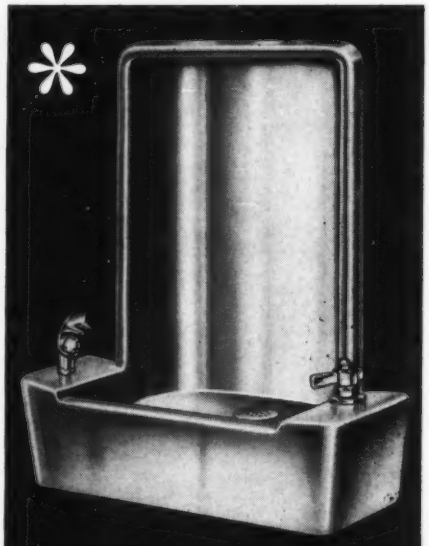
C. A. Bishop, director of chemical engineering development, at U. S. Steel, Pittsburgh, was chairman of the committee which prepared the statement.

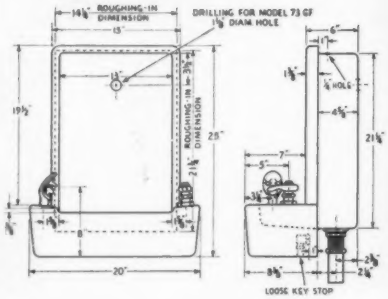
Mail ballots will be sent to AIChE members this month. Candidates, chosen by the nominating committee, are George E. Holbrook, industrial executive, president; Donald L. Katz, educator and consultant, vice-president; Walter E. Lobo, industrial executive, vice president; F. J. Van Antwerpen, for re-election, secretary; and J. Henry Rushton, educator and consultant.

The education and accreditation committee of AIChE has formulated a definition of the first professional degree for accreditation in Chemical Engineering. The first organization to accredit colleges, the AIChE now passes its recommendations to the ECPD, as do the Founder Societies.

The definition was necessary because the AIChE recognized five year courses, with a Bachelor

fine plans demand FINE DRINKING FOUNTAINS by HAWS





Model 73, in stainless steel . . . beautifully styled to match grand surroundings—with HAWS raised, shielded, anti-squirt head, and automatic stream control. Same distinctive design available in vitreous china (Model 77).

Specify HAWS recessed fountains . . . and be *sure* of drinking facilities that match the quality and distinction of your finest project. Snugly recessed in the wall, they provide the utmost in modern drinking convenience . . . and HAWS workmanship assures the finest sanitation and service.

WRITE FOR DETAILS! These and hundreds of other fountains are illustrated in HAWS new 1957 catalog. *Ask for your free copy!*

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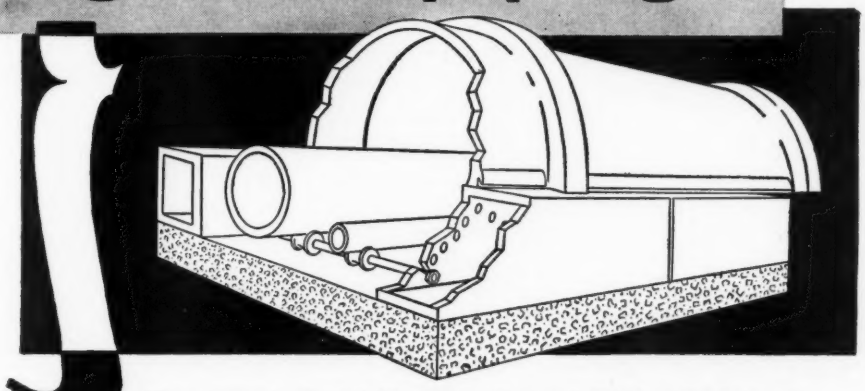
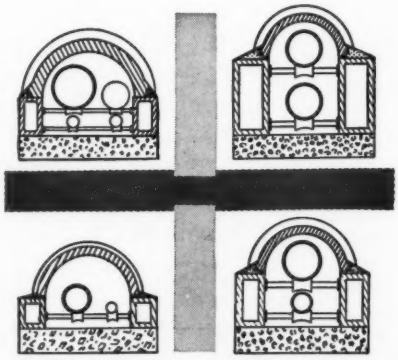
PERMANENT PROTECTION
for underground piping!

STILLWATER CERT-A-BAR* TUNNEL CONDUIT SYSTEM



New ceramic Cert-A-Bar Pipe Support Blocks eliminate the need for interior cast iron rests. The perforated block is laid as a structural support member at regular intervals, and the bars are simply inserted and locked in place.

THE vital consideration in selecting an underground conduit system is *permanent* protection . . . not for one year or five, *but for the life of the piping.* You get the best possible protection for your underground metal service piping with a Stillwater Conduit System of vitrified clay. It's chemically inert—can't rust, rot, corrode, or decay . . . ever. And it is manufactured in accordance with ASTM specification C-13-54, assuring proper strength and quality. Any combination of service piping can be protected. Conduit is available in a wide range of sizes, with a complete line of fittings and accessories, including alignment guides, lateral guides, and anchors. Any contractor's crew can handle the installation easily, or if you prefer, Stillwater Licensed Installers will assume the responsibility. The Cert-A-Bar Tunnel System can be installed with any of three suggested new waterproofing specifications —one for average conditions, one for intermittent ground water conditions, and a third for high water table conditions. It's the lowest-cost conduit per year of service that you can specify or install!



THE CERT-A-BAR SYSTEM HAS ALL THESE IMPORTANT ADVANTAGES

- Inherent structural strength for permanent protection
- Complete flexibility for design
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- Quickly installed
- Keeps pipe insulation dry
- No electrolytic corrosion of piping
- No maintenance required

A few of the hundreds of possible combinations of piping for the Cert-A-Bar Tunnel System are shown at left.

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illustrated, four-page circular with complete installation specifications.

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STILLWATER CONDUIT DIVISION
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STILLWATER CONDUIT SYSTEMS

Photos courtesy of Columbus Dispatch

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Here's double-barreled doorway efficiency and protection!

A Kinnear Steel Rolling Door and Rolling Grille in the same opening! Both open *upward,* coiling into a small space above the doorway.

When the grille alone is closed, it bars intruders without blocking light, air, sound, or vision.

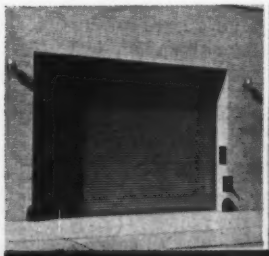
When the Kinnear Rolling Door is closed, its rugged curtain of interlocking steel slats gives extra protection against weather, intrusion, and fire.

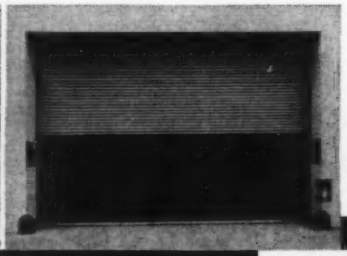
With both door and grille closed, a *double* steel barrier repels vandals, thieves, or troublemakers.

Separately or together, the door and grille can be raised or lowered by push button. When opened, they clear the entire doorway, and stay completely out of the way. Whether opened, closed, or in action, they never take up usable floor, wall or ceiling space.

For safety, eye-appeal, efficiency and protection at doorways of any size, in new or old buildings, with any architecture or building material, you get top value with Kinnear Rolling Doors. Their *coiling upward action* has been proved by more than half a century of time-saving, space-saving, low-cost performance. Write today for full information.

HEAVILY Galvanized for lasting protection, Kinnear Steel Rolling Doors are thoroughly coated with 1.25 oz. of pure zinc per square foot of metal (ASTM Standards) then treated with Kinnear's special Paint Bond to assure quick firm full-coverage of field applied paint.





The neat, trim appearance of Kinnear Rolling Doors and Grilles is evident in the new and modern building housing the newspaper printing presses of the Columbus (Ohio) Dispatch.

KINNEAR
ROLLING DOORS
Saving Ways in Doorways

The KINNEAR Mfg. Co.
FACTORIES
1560-90 Fields Avenue, Columbus 16, Ohio
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of Science and a Chemical Engineering degree, but did not accredit Master of Science courses.

The new definition states that "The American Institute of Chemical Engineers will consider for accreditation the curriculum of an institution which culminates in the first professional degree in an area of chemical engineering. In general, it shall be an engineering degree modified by an adjective (chemical, nuclear, process, petroleum, refining) which indicates an area of interest to the Institute. The institution may award an earlier degree provided it is differentiated from the degrees for which accreditation is sought. It is immaterial whether the institution requests accreditation at the bachelor's or master's level. It is material that the curriculum and degree for which accreditation is sought to be clearly specified."

AIChE has voted to retain Raymond B. Mayer & Associates as public relations counsel, effective as of Jan. 1, 1958. Mayer also will represent the Chemicals at their annual meeting Dec. 8 to 11 in Chicago.

Already, the AIChE is making plans for an international Golden Jubilee, to be held June 22 to 27, at the Bellview-Stratford Hotel, Philadelphia, in honor of the group's 50th anniversary.

A new symbol and slogan for the society has been adopted, and will be presented at the Jubilee. An estimated 3500 delegates are expected to attend.

Among the speakers scheduled are Crawford H. Greenewalt, president of E. I. du Pont de Nemours & Co., Inc., and John Oriel, former president, British Institution of Chemical Engineers.

"Unity" is quite a controversial subject around headquarters these days. In fact, it has been decided that the formal name of the new engineering building is to be United Engineering Center, but in some of the publicity the "U" in "United" is not capitalized.

beautiful from the OUTSIDE...

...even *Greater Beauty* when you step inside!

The beauty of a Benjamin Panel-Glo lighting system cannot be confined. It comes right through to the outside! It supplements today's slickest store fronts to attract even more traffic and beckon even more potential customers to "come on in." On the inside, Panel-Glo's gently-diffused, shadow-free, high-level lighting stimulates a greater desire to buy. Gone is the forest of lighting fixtures, ugly ducts, pipes, beams and other ceiling irregularities. Panel-Glo conceals them all, to create a magnificent ceiling of light . . . at lower-than-ever cost! Send for Panel-Glo Facts Bulletin. Benjamin Electric Mfg. Co., Dept. CEN, Des Plaines, Ill.

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BENJAMIN

...always the source of good lighting

Now Setting the Pace in COMMERCIAL LIGHTING

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with
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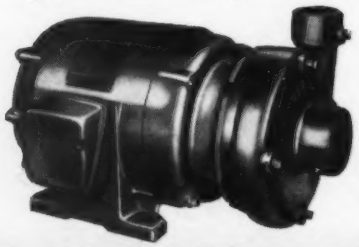
PUMPS too...

TOP
PERFORMANCE
COUNTS!

The ability to turn in an outstanding performance every time . . . to come through a winner when the going is toughest . . . that's the mark of a top-flight tournament golfer.

And it's this ability for outstanding performances that makes WEINMAN Close-Coupled AC Pumps so great. You know that here's a pump that will outperform all others, year after year. Economical to buy, operate and maintain, WEINMAN Type AC Pumps are real space savers, too. Compact and powerful, they can be mounted in any desired position. What's more, they'll give you consistent leakless operation, even when handling water containing abrasive dust.

No matter how specialized your need for a circulating pump . . . for air conditioning systems, cooling tower circulation, hot or chilled water circulation, booster service or general pumping needs . . . you'll find the right pump for your needs in WEINMAN'S big AC line. Call your nearest WEINMAN Pump Specialist for help in solving your pump problems. He's listed in the yellow pages of your telephone book.



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The ASCE-AIA Joint Cooperative Committee has approved a form contract to be sent to the boards of directors of the two groups for approval.

The contract covers lump sum fee, percentage of contract costs, engineers costs plus a percentage, and engineers expense multiple. Similar forms are being prepared for when the engineer is the prime professional.

The form contract adopted was the seventh draft. The ASCE committee on professional practice approved one contract, which had been developed jointly with the architects, in 1955. The principles in this contract, (never approved) were used in the new drafting.

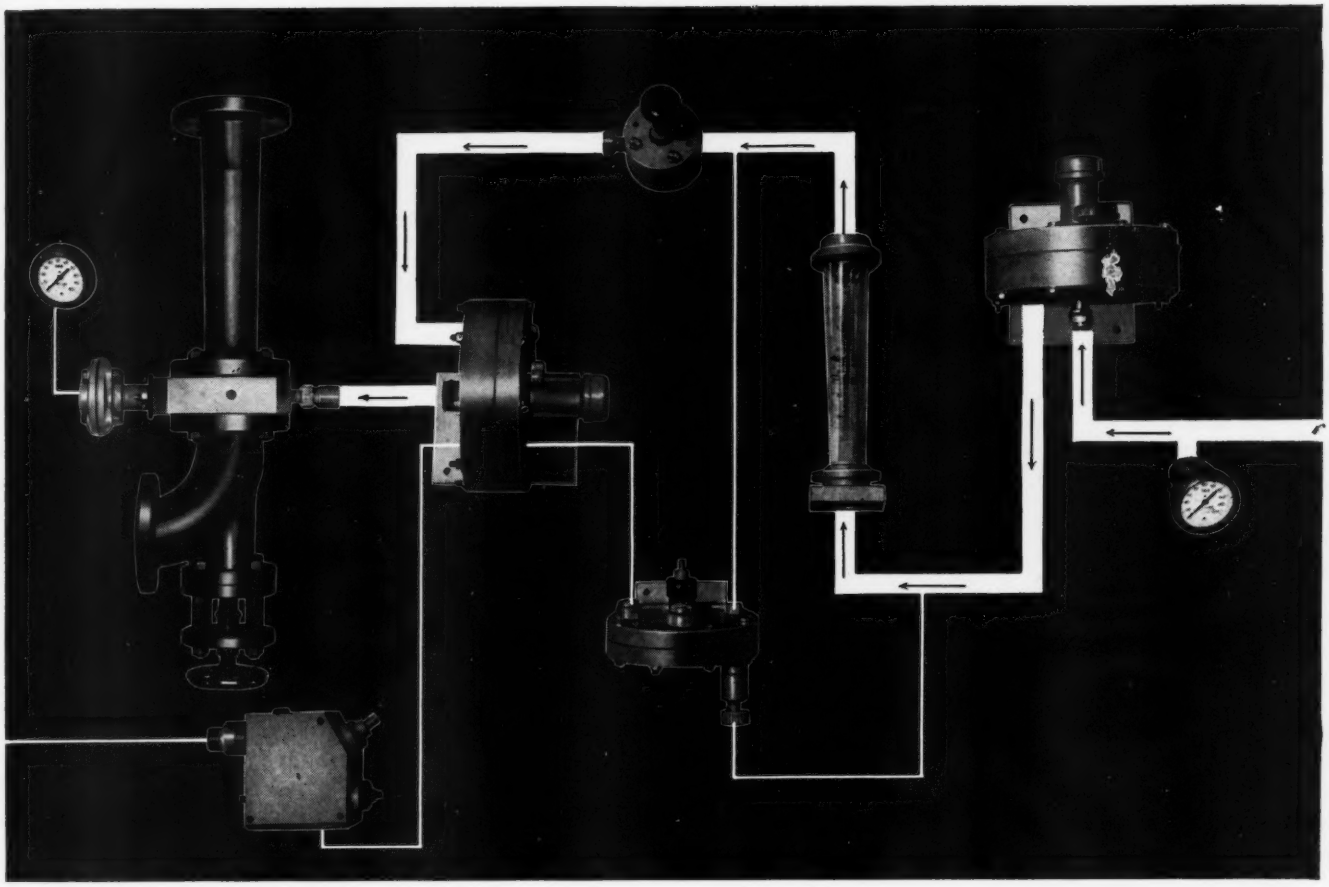
Col. Clarence E. Davies, building coordinator for the new engineering center, was sent to Europe to extend an invitation to representatives of 13 engineering societies in Austria, Belgium, Denmark, Finland, France, Germany, Holland, Italy, Norway, Sweden, Switzerland, and the United Kingdom to share the facilities of the new center.

The colonel was accompanied on his trip by O. B. Schier, who will take over Davies' post as ASME secretary later this year.

Meanwhile, Dr. Mervin J. Kelly, president of Bell Telephone Laboratories Inc., will be general campaign chairman for a $10 million headquarters fund for the United Engineering Trustees Inc., which represents the AIEE, the ASCE, the ASME, the AIME, and the AIChE.

The AIME and the ASME are meeting in Quebec City, on Oct. 10 and 11, for a Joint Solid Fuels Conference. One of the major topics of discussion will be the effect of the St. Lawrence Seaway on coal marketing in North America.

At the same time, the ASME and the American Bureau of Standards are sponsoring a meeting in Canada to discuss drafting standards in the U.S., Canada, and



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Flexibility . . . corrosion resistance . . . safety . . . low maintenance . . . proved performance . . . *whatever* you're looking for, you can be sure of finding it in Fischer & Porter's Model 1052A. The most imitated chlorinator ever introduced, Model 1052A remains unequalled in every major area of chlorinator performance and economy. Engineered from the ground up by chlorine control experts, it's an outstanding example of design from the *user* point of view.

flexibility matches the job

Model 1052A accommodates flow rates from 30 PPD to 8000 PPD by merely changing the chlorine flowmeter . . . a two minute job. And variable orifice ejector makes operation easy under varying conditions. Models are available for all types of manual, semi-automatic, and automatic operation with or without alarms.

corrosion-resistance for long trouble-free life

Recognized as a triumph in materials engineering, the Model 1052A is fabricated of inert materials throughout. Color is impregnated in the fiber glass plastic cabinet . . . never needs painting or coating. The only metals in contact with chlorine are silver and tantalum. The high pressure inlet tube is solid fine silver, and all other tubing is rigid corrosion-resistant plastic.

safe operation protects plant, personnel, public

System design protects against chlorine leakage, positive pressure conditions, excess vacuum, and flooding . . . eliminates need for hazardous water seals.

easily maintained for minimum down-time

Maintenance, like operation, requires no special skills. Any component can be removed for inspection with a screwdriver, wrench, and pliers in a few minutes. And engineering service is available from forty field offices across the country.

proved performance assures results

Every feature of the Model 1052A has proved itself in years of actual use. Every material used in construction has successfully withstood many years of severe chlorine service. But the best proofs of performance are the thousands of satisfied users of Fischer & Porter Chlorinators throughout the country.

Write now for complete details on the Model 1052A given in Catalog 70-15, available on request . . . and with it, we'll be happy to provide a list of installations. Visit any one of these and you'll see why so many users have found everything they were looking for in a Fischer & Porter Chlorinator. Write Fischer & Porter Company, 3407 Fischer Road, Hatboro, Pa. In Canada, write Fischer & Porter (Canada) Ltd., 2700 Jane Street, Toronto, Ontario, Canada.

FP

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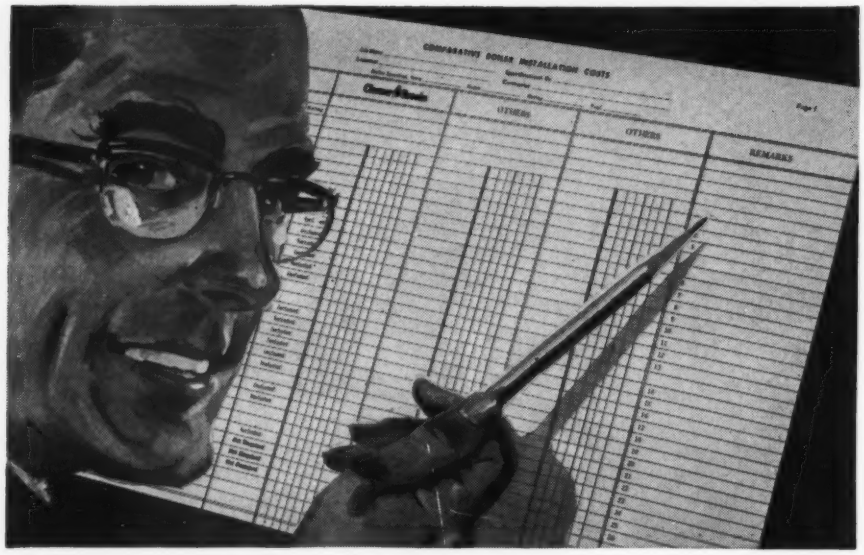
Complete Process Instrumentation

Before you buy any boiler

compare quoted prices with REAL COSTS



New Cleaver-Brooks cost analyzer clears "quotation" confusion — reveals ALL costs

Get *all* the costs . . . the *real* costs . . . down on paper before you recommend or specify a boiler to your clients. On many boiler installations "quoted prices" seldom agree with the total costs, as you may have learned. This is frequently the case with so-called "built-up" boilers assembled on the site.

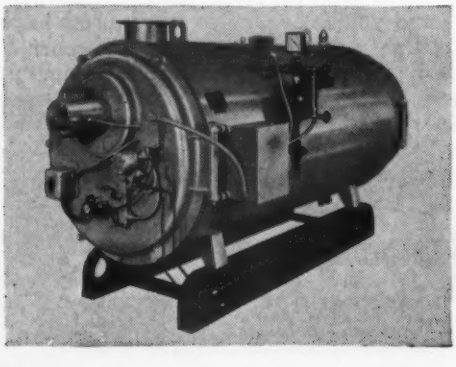
Cleaver-Brooks' cost analysis enables you to compare all material costs (boiler, steam trim, burner, refractory, controls and other equipment) and installation labor costs. You'll know the "real costs" on the complete installation before you start.

Real eye-opener

The figures you'll see may be startling. In most cases the cost analysis proves a Cleaver-Brooks costs *less*. On-job time is drastically reduced because Cleaver-Brooks packaged units are fully assembled, ready to install. Cleaver-Brooks boilers give you more in performance, too . . . each boiler is fully fire-tested at the factory under load, tuned to peak economy. Starting service and on-the-job operator training by authorized field engineers further decreases your over-all costs.

Contact your Cleaver-Brooks agent

Once you add up all the benefits of a Cleaver-Brooks "one-cost" package . . . the proved trouble-free economy of exclusive four-pass, forced-draft design, you'll find it pays over and over to analyze costs carefully before you buy. See your Cleaver-Brooks agent for details or write Cleaver-Brooks Company, 326 East Keefe Avenue, Milwaukee 12, Wisconsin.



Choose from 19 sizes, 130 models, 15 to 600 hp. Oil, gas and combination oil/gas fired — steam or hot water for heating or processing.

Cleaver Brooks

ORIGINATORS OF SELF-CONTAINED BOILERS

the United Kingdom. Meeting with the United States delegates will be representatives of the Canadian Standards Association and British Standards Institute.

If no standard can be agreed upon, the group plans to discuss a possible appendix, which could be inserted in any drafting manual explaining the drafting practices of all three nations.

Objectives of a standard drafting procedure for the three nations is to save drafting time, to eliminate rejections caused by misunderstandings, and to make drawings easier to read.

The ASCE Committee on Engineering Education has voted (in cooperation with other interested groups) to urge engineering schools to consider the adoption of a 12-month school year.

The committee pointed out that there is a serious shortage of physical facilities and of faculty members in American colleges and universities — yet the present facilities and teachers are used, in general, only part time.

The Western Society of Engineers will be local sponsors for a meeting in Chicago, Oct. 31-Nov. 2.

Theme of the national conference, to be sponsored by EJC, the Scientific Manpower Commission, the National Science Foundation, and the National Academy of Sciences — National Research Council, will be "Engineering and Scientific Education."

The conference is planned to provide an up-to-date picture of the technical manpower problem, highlight the problems of higher education in engineering and science (and explore remedies), and contribute to general understanding of higher education problems in technology.

The New York Association of Consulting Engineers has moved from Room 1915 at 220 East 42nd St., to Room 1715 at the same address. Telephone number of the Association will remain the same, MUrrayhill 2-8965. ▲▲

OR BLUFFTON HIGH

Approximately 240 tons of USS Structural Steel were used in the construction of the gymnasium. The steel framework was erected in seven weeks—joining accomplished by bolting and welding. The total structure—masonry, floor, seats, fixtures, everything—was completed and ready for use in 12 months.

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Please send me a free copy of **Hot Rolled Carbon Steel Shapes and Plates**—a handbook containing details, dimensions and weights of all USS Structural Steel.

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The Legal Aspect

MELVIN NORD, P.E.
Consultant in Legal and Technical Problems
Patent Attorney

The International Atomic Energy Agency

On October 23, 1956, eighty-two countries unanimously adopted a Draft Statute of a proposed International Atomic Energy Agency. The conference was the largest of its kind in modern history.

On July 29, 1957, after ratification by the required number of countries, the Agency came into being, with the United States as a member. The United States government has allocated money and fissionable material for the Agency, which is the outcome of President Eisenhower's 1953 atoms-for-peace speech at the U. N.

Purpose of the Agency

The Agency is authorized "to encourage and assist research on, and development and pracical application of, atomic energy for peaceful uses throughout the world, to make provision . . . for materials, services, equipment, and facilities to meet [these needs], with due consideration for the needs of the under-developed areas of the world, to foster the exchange of scientific and technical information on peaceful uses of atomic energy, to encourage the exchange and training of scientists and experts in the peaceful uses of atomic energy, to establish and administer safeguards designed to insure that special fissionable . . . materials . . . are not used in such a way as to further any military purpose, to establish . . . standards of safety for protection of health and minimization of danger, and to acquire [necessary] facilities."

Election of Officers

A General Conference, at which each member country has one voting delegate, elects the officers. On most matters, a simple majority of the General Conference rules, but on some matters such as the budget, amendments of the Statute, and suspension of a member, a two-thirds majority is required. In addition to electing officers, the General Conference elects members of a Board of Governors, approves the admission or suspension of countries as members, approves the budget, approves reports to be submitted to the U.N. and agreements to be made with the U.N., approves amendments, and in general has ultimate but nonsupervisory powers.

Basic Principle

According to Article IV. C of the Statute, "The Agency is based on the principle of the sovereign equality of all its members," and the idea of the General Conference (like the General Assembly of the U.N.) is based on this principle. This principle is supposedly based on democratic ideas of equality. But, as has been seen in the General Assembly of the U.N., it has serious drawbacks, and ought not to be perpetuated, and certainly should not be expanded further. It is based on a purely phony egalitarianism, which is supposed to make the underprivileged feel as though they were privileged. What is phony about it is that it purportedly makes certain more or less accidentally or arbitrarily selected geographical areas equal to others, also arbitrarily selected, even though the areas actually are not equal.

The Republic of Honduras for example, is no more equal to the United States than fifty is equal to one, but while it is all right to know that, it is not all right to say so — because it sounds undemocratic. Even with the very best intentions, we cannot make the Republic of Honduras equal to the United States in any meaningful sense. But the worst feature of this current dogma, which is deduced from the sacred cow of sovereignty, is that in the name of democracy real democracy is subverted. Even

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Through outstanding engineering developments and modern manufacturing facilities, ADVANCE TRANSFORMER COMPANY has become the world's largest manufacturer devoted exclusively to the production of quality fluorescent lamp ballasts. These precision built, power regulating instruments supply exacting amounts of electrical energy for the efficient operation of all fluorescent lamps and are aptly called "THE HEART OF THE LIGHTING INDUSTRY."

Continuing research and constant new developments in both engineering and manufacturing divisions have made possible the introduction of many new ballasts with exclusive patented features. Thus, ADVANCE provides lighting equipment manufacturers, designers, architects, engineers, contractors and other fluorescent lamp ballast users the world's most extensive line of fluorescent lamp ballasts. When you use ADVANCE, there is a ballast for every specific purpose, never a need to compromise.

ADVANCE ballasts are listed by Underwriters' Laboratories, Inc., meet the Canadian Standards Association requirements and many meet or exceed Certified Ballast Manufacturers' specifications. Specify ADVANCE to be sure to get the ballasts with the "plus factors" that have built the world's largest company devoted exclusively to the manufacture of fluorescent lamp ballasts.

The Advance Transformer Company will replace, at no charge, any ADVANCE fluorescent lamp ballast which becomes inoperative within two years from date of manufacture, provided the conditions of ballast operation have conformed to the company's recommendations and the inoperative ballast is returned to an authorized ADVANCE Service-Stocking Distributor.

For anyone who manufactures, specifies, installs or uses fluorescent lighting, ADVANCE TRANSFORMER COMPANY has prepared helpful literature which they will gladly send without cost or obligation.

Fluorescent Lamp Ballast Buyer's Guide

This eight-page brochure gives data on the world's most complete line of Fluorescent Lamp Ballasts. It includes specifications, wattage, watt loss, circuit voltage, dimensions, weight, etc. This brochure is an invaluable aid for specifiers and users of fluorescent lamp ballasts.

Fluorescent Lamp Ballast Cross Reference Guide

This helpful guide lists many popular ballasts by catalog number and the ADVANCE ballast that should be used whenever ballast replacement becomes necessary. It is an invaluable reference chart that saves time and money for all users of fluorescent lamp ballasts.

Service-Stocking Distributor Plan and List of Distributors

This is a six-page color brochure that lists, by city and state, more than 550 distributors who carry a stock of ADVANCE Fluorescent Lamp Ballasts, to provide immediate replacement service for *ballasts of any make* that become inoperative.

You may receive a copy of one or all of these brochures by writing ADVANCE TRANSFORMER COMPANY, Marketing Division, 2950 North Western Avenue, Chicago 18, Illinois.

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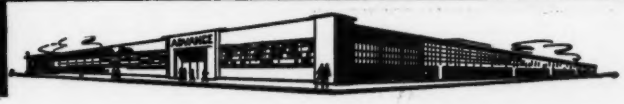
CBM CERTIFIED

World's Largest Exclusive Manufacturer of Fluorescent Lamp Ballasts

TRANSFORMER CO.

2950 NO. WESTERN AVE. CHICAGO 18, ILL. U.S.A.

The Heart of the Lighting Industry

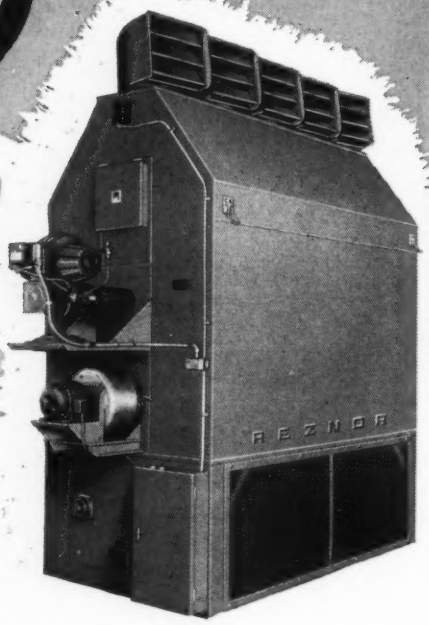


Here's the answer to your

BIG SPACE HEATING PROBLEMS

Reznor-Olson

STAINLESS STEEL DIRECT FIRED HEATERS

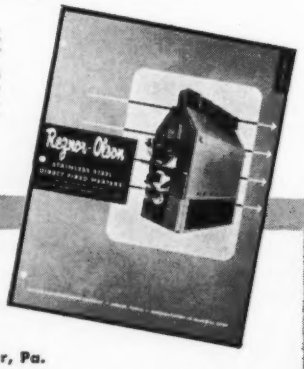


These units are designed for heating factories, warehouses, garages, airplane hangars, gymnasiums and other large open areas. They pick cold air up off the floor, distribute heated air overhead at high velocity—either direct or thru ducts. In addition to space heating installations, Reznor-Olson heaters are well-suited for use in make-up air systems and in drying and other process applications.

Reznor-Olson heaters are available in ten sizes — 400,000 to 2,000,000 Btu — with gas, oil or dual-fuel burners. They may be floor mounted for top discharge or suspended for down-blast or horizontal discharge.

New Bulletin gives Complete Specifications

Complete specification information — including dimensions, control details, temperature rise, air delivery and fuel consumption — is included in a new bulletin, F-57A-RO. If you don't have a copy of this bulletin in your files, just fill out and mail the coupon below. Do it today.



REZNOR
WORLD'S LARGEST-SELLING DIRECT-FIRED UNIT HEATERS

Reznor Manufacturing Company, 78 Union St., Mercer, Pa.

Please send me a copy of your bulletin F-57A-RO which gives complete specification data and construction details on Reznor-Olson direct fired heaters.

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the word "democracy" should remind us that we are talking about people, not territory. In order to make democracy work, it is necessary that people be equal, not oddly assorted groups of people of enormously varying numbers. The more we espouse the unsound idea of equality among nations, the more we attempt to create inequalities among people.

Board of Governors

The idea of equality of sovereign states is not new. Not only is it found in the U.N., but it is also found in the organization of the Senate of the United States. But no one claims that the United States would be a democracy if it did not have a second House, which is reasonably well representative of people, one at a time, rather than in oddly assorted clumps. But in the International Atomic Energy Agency, the pattern of the U.N. has been followed rather than that of the United States. There is, it is true, a second body. In the U.N. it is a peculiarly "unequal" Security Council and in the International Atomic Agency, it is called the Board of Governors. This group — just as the Security Council of the U.N. — clearly gives the lie to the whole concept of equality of sovereign states. The big "five" — the nations "most advanced in the technology of atomic energy" — must be represented on the Board (presumably Canada, France, USSR, Great Britain, and the United States, at the present time), plus additional nations selected from each of the other eight general geographical areas of the world not already included. This means, at present, Latin America, Africa and the Middle East, South Asia, Southeast Asia and the Pacific, and the Far East.

Small Four Members

In addition, for some mysterious reason, there also must be two members selected from the "small four," Belgian, Czechoslovakia, Poland, and Portugal, who are

take a new look at bulk handling

STRAIGHT UP: Ultra Chemical Works, Inc., took a new look at their handling and installed this automatic Airstream Conveyor. The unloading line pictured carries bulk chemicals from hopper trucks to storage. This versatile system also removes chemicals from storage and discharges accurately weighed batches to process. All operations are centrally controlled.

Bulk handling methods have been developing fast in recent years—but none has advanced as far as Dracco Airstream Conveyors! Here's what has been done to improve and expand Airstream handling techniques:

HIGHER CAPACITIES: More tons per hour handled over longer distances and greater heights.

MORE AUTOMATION: Remote-controlled devices, automatic operation and programming permit close integration with production.

GREATER COMPLEXITY: Intricate or diverse handling requirements can be met with multiple-function systems.

LOWER LABOR REQUIREMENTS: One-man or part-time supervision with no manual handling provides the *lowest* labor costs.

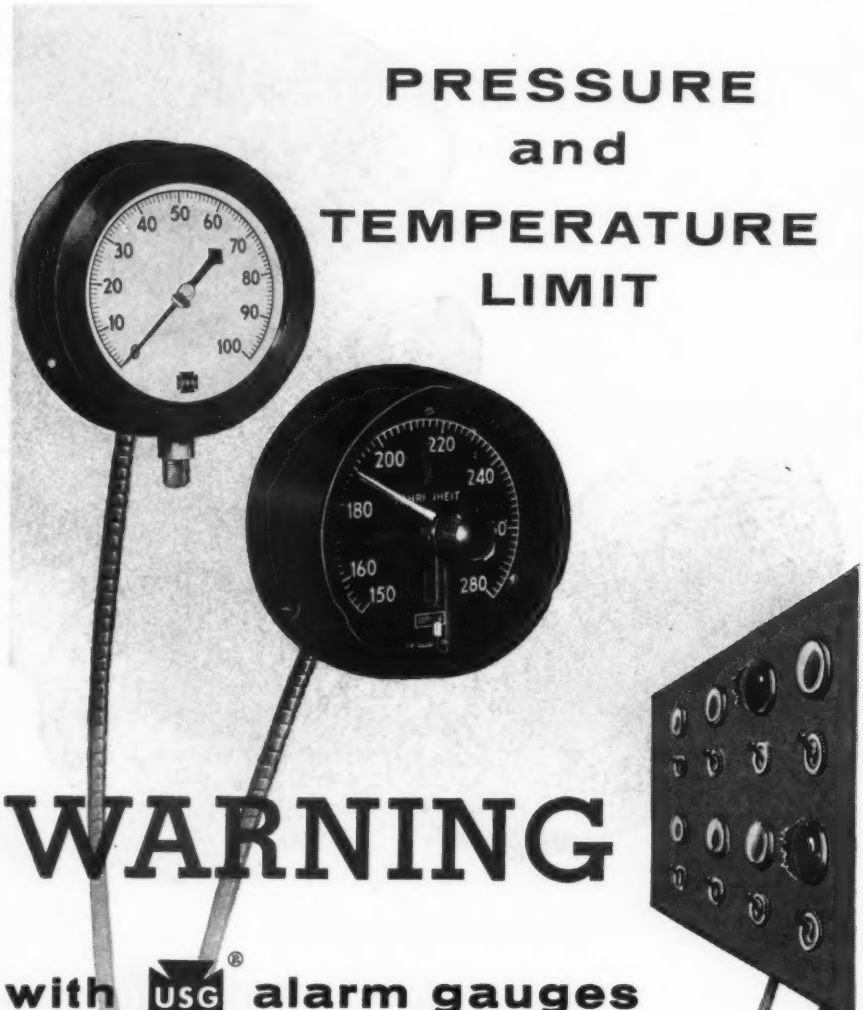
NEW VERSATILITY: Airstream Conveyors can handle many new materials, or weigh, batch, blend, mix, proportion and bulk-load—all automatically if desired.

Despite these significant developments, Airstream Conveyors still offer the most advantageous balance of first cost, labor costs, power consumption, and maintenance expense. If your plant uses as little as one carload of free-flowing bulk materials a week, you can profit from Airstream Conveyors. Call or write Dracco today.

DRACCO CORPORATION

4030 East 116th Street · Cleveland 5, Ohio

DRACCO *airstream* conveyors
dust control equipment



PRESSURE
and
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LIMIT

WARNING

with USG® alarm gauges
and thermometers

These instruments provide a warning signal when temperature or pressure in a process rises or falls beyond predetermined danger limits.

Limit contacts are adjustable over the entire range with a "gap" as narrow as 2%. Suitable for lights, bells, buzzers or other signaling equipment requiring 0.1 amps or less. For larger alarm or relief devices, external relays can be furnished to increase rating to 6 amps.

Instruments may also be used as limit controls and as on-off controls when used in conjunction with lock-in relays and suitable delay tubes.

Available in cast iron or phenolic turret case in 12 pressure dial graduations from 0-30 lbs. to 0-10,000 lbs. Vacuum ranges 0-30". 5 compound dial graduations from 30"-30 lbs. to 30"-300 lbs. Thermometers available in all standard mercury, vapor and gas ranges with phenolic case only.

For complete details call your nearest USG distributor . . . see the "Yellow Pages" of your phone book . . . or write the factory for descriptive literature.

Find Your Nearest Distributor in the "Yellow Pages"

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Home of the SUPERGAUGE®

MORE THAN 50,000 TYPES OF GAUGES • SUPERGAUGES • SOLID FRONT GAUGES • RECEIVER GAUGES • TEST GAUGES • RECORDERS • CONTROLLERS • TRANSMITTERS • PSYCHROMETERS • AVIATION INSTRUMENTS

producers of uranium and other source materials. What makes these countries more equal than others is hard to say, except that two out of four are in the Russian orbit. The selections are to be made by the outgoing Governing Board, or, in the beginning, by a Preparatory Commission consisting of Australia (Southeast Asia and the Pacific), Brazil (Latin America), India (South Asia), Union of South Africa (Africa and the Middle East), the "big five," and Belgium, Czechoslovakia, and Portugal from the "small four."

General Members

In addition to the "big five," two of the "small four," and other geographical selectees, ten additional members of the Governing Board also will be elected by the General Conference with due regard to "equitable representation" on the basis of the eight general geographical areas of the world, except North America (since we have more or less exhausted this area by including Canada and the United States as two of the "big five" countries).

Thus, it may be seen that a very confusing and complex mixture of equal and unequal treatment of sovereign states has been attempted — with what results no one can predict at this time.

Voting

Voting methods (simple majority and two-thirds majority) are rather similar in the Governing Board to those described above in connection with the General Conference. The Board is given the general authority "to carry out the functions of the agency . . . subject to its responsibilities to the General Conference." (Art. VI.F.).

Director General

The Statute also provides for the selection, by the Board of a Director-General and staff.

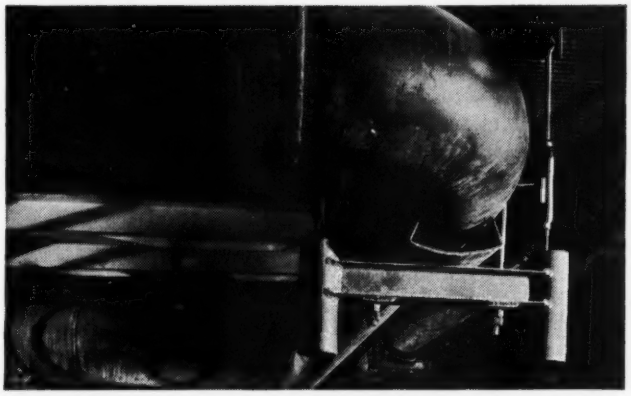
Supply of materials by countries such as the United States

BLAW-KNOX has what it takes—to provide these products and services

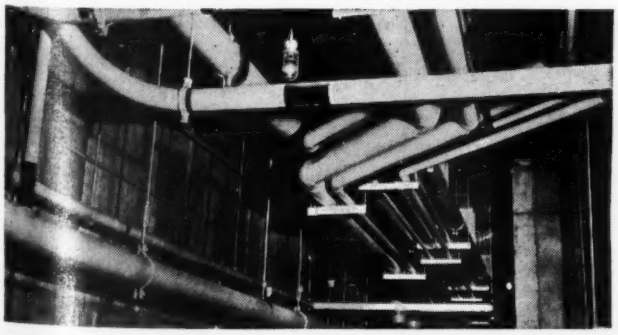
A Blaw-Knox automatic sprinkler system could have prevented this disastrous fire. Each year a serious fire strikes one out of seven manufacturing firms in this country. And out of every 100 firms who lose their records in a fire, 43 never reopen for business. So why take any chances.

Blaw-Knox engineers, fabricates and installs automatic sprinkler systems that are always alert to detect, confine and quench a fire at its origin. Qualified engineers custom-design systems that meet individual requirements—and fulfill all insurance standards and municipal codes. A Blaw-Knox automatic sprinkler system pays for itself in a few years through savings in reduced insurance premiums.

Let a Blaw-Knox fire-protection engineer study your needs, submit a layout and estimate, and tell you how you can pay for the system on our lease or deferred payment plan. For more complete information, write for Bulletin No. 2426—"Fire Can Destroy Your Business."



Blaw-Knox trapeze functional spring hangers, with the patented internal swivel action, support power piping in new generating station. Our experienced engineers are available to both design and make recommendations for your hanger requirements. For further information, send for Catalog No. 54.



High temperature, high pressure oil tunnel piping in large steel mill is typical of many piping systems prefabricated and erected by Blaw-Knox. Experienced piping engineers, modern shop facilities and a new Blaw-Knox digital computer method for fast, accurate calculation of piping stresses are available to you. Let us know your requirements and we will provide the service you need. For additional information, write for Bulletin No. 2443—"Piping for Industry."

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Power Piping and Sprinkler Division

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Complete facilities for prefabrication and erection of piping systems for all pressures and temperatures
... complete line of standard and custom-engineered pipe hangers, supports and vibration eliminators
... complete line of automatic sprinkler systems for standard and special hazards

Sier-Bath SCREW PUMPS

providing 7 years' dependable, trouble-free service

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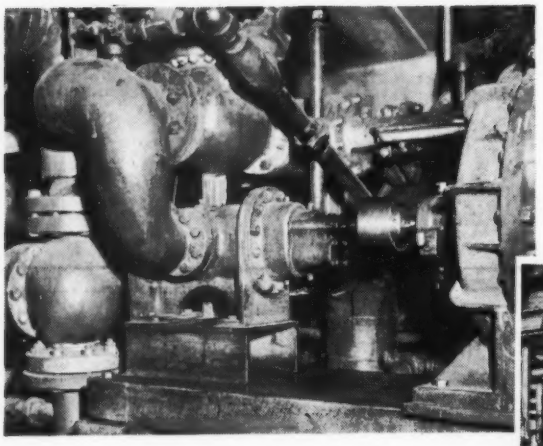
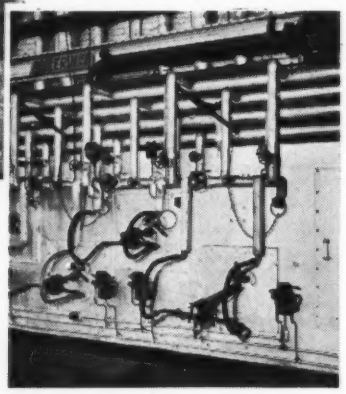
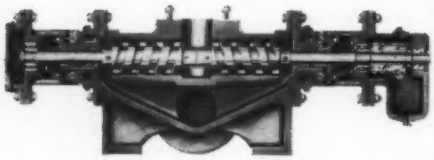




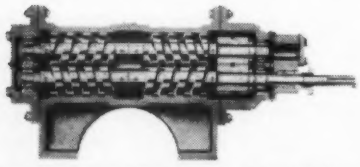
Pumping fuel oil to boilers at 350 psi., 24 hours a day, 7 days a week, with low operating and maintenance costs.

Installed in 1950, these Sier-Bath Screw Pumps are used to pump fuel oil at temperatures of 125-150° F. from first floor to boilers on the third floor. Since installation, these pumps have been providing steady, powerful, dependable pumping.

Sier-Bath SCREW PUMPS



External Gear and Bearing Bracket Type for non-lubricating liquids and semi-liquids



Internal Gear and Bearing Type for lubricating liquids and semi-liquids

Sier-Bath Screw Pumps maintain high volumetric efficiency because "Dual-Controlled" precision rotor design prevents rotor-to-rotor or rotor-to-casing contact—provides a continuous flow without pulsation, hammering or vibration . . . without strains, misalignment and wear on rotors, shafts, bearings and gears.

Result: Dependable, uninterrupted pumping service—less downtime—less maintenance—easier servicing—longer pump life—lower overall pumping costs.

Capacities from 1 to 1,000 gpm.; viscosities from 32 SSU to 1,000,000 SSU.; discharge to 1,000 psi. for viscous liquids, 200 psi. for water and light oils. Horizontal or vertical construction. Corrosion resistant alloys, special bodies, stuffing boxes and bearings for special needs. Call your Sier-Bath representative or write Sier-Bath Gear & Pump Co., Inc., 9257 Hudson Blvd., North Bergen, N. J.

Sier-Bath ROTARY PUMPS

Screw Pumps Gearox® Pumps Hydrox® Pumps

50th Anniversary Mfrs. of Precision Gears, Rotary Pumps, Flexible Gear Couplings Member A.G.M.A

will be on a voluntary basis, that is to say, by direct negotiations between the Agency and the country involved.

Safeguards

In order to make sure that none of this fissionable material is diverted to military uses, Article XII of the Statute calls for a rather rigid inspection, reporting, and accounting system. The Statute does not forbid any country receiving materials to engage in the manufacture of atomic weapons, but simply prevents the material supplied by the Agency from being used for that purpose. Of course, this makes it possible, in principle, for a country to make more atomic weapons than it would otherwise make by eliminating its need to divert fissionable materials to peaceful uses.

Practical Results

The practical result to be expected is that underdeveloped countries, who would otherwise not be in a position to make either peaceful or military uses of atomic energy for a long time, now will be able to experiment with peaceful applications of atomic energy. Futhermore, it is to be hoped that the idea of inspections may eventually prove to be infectious in the "big five" countries, as well.

The First Step

Thus, while the Agency may be a peculiarly hacked-out political compromise in some respects, it is, on the whole, a worthwhile step in the right direction. It is inherently worthwhile in that it provides valuable assistance to underveloped countries; and it is potentially even more worthwhile in that it provides an opportunity for a great many countries to work together for a creative purpose rather than for purely defensive purposes. Let us hope it will prove to be the first and not the last step in the right direction.

Next month's column will start a series on municipal corporations law. ▲▲

Control leadership through advanced engineering—research

AIR BLENDER SOLVES DUAL-DUCT DISTRIBUTION PROBLEMS

Provides constant delivered air volume, needs no recalibration when you add to system

WITH THE new Honeywell Air Blender your clients get the level of comfort they want—on the simple call of the room thermostat.

They get this easily, because the Honeywell Air Blender combines temperature and volume control in one unit.

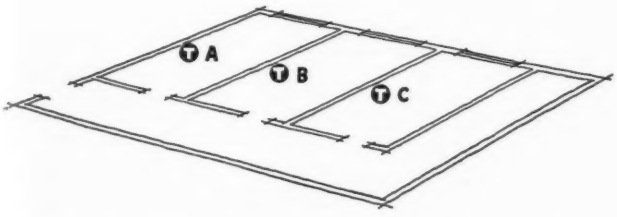
And comfort doesn't come at the expense of some other room. It comes from the system. *One room no longer "robs" another of comfort.*

Besides providing constant delivered air volume, the Honeywell Air Blender takes well to change. With Dial Air Balancing you can add to the system without having to recalibrate distribution points that may be scattered widely—especially valuable in floor by floor modernization or on new construction.

Self-powered, the Honeywell Air Blender uses the pressure of the air it is controlling to actuate the diaphragm—its only moving part. Such simplicity makes possible long life and trouble-free performance.

For further information about the Honeywell High Velocity Air Blender and other Honeywell heating and air conditioning products, call your local Honeywell office. Or write to Minneapolis-Honeywell, Dept. CO-10-194, Minneapolis 8, Minnesota.

No room "robs" comfort from another



For the first time in high velocity air handling history you can design a system where adjustment in one room doesn't upset comfort balance in others. Thus, in a typical office, adjustment in area A does not rob comfort from B or C. Neither delivered air volume, nor the ratio of hot to cold air is affected in B or C. This is one of the reasons why it's wise to design with the new Honeywell Air Blender in mind.

The "new" look in thermostats that's appearing on walls of commercial buildings throughout America. New design *inside* gives closer control, vastly superior performance.

Only Honeywell gives you all four—pneumatic, electric, electronic, instruments.

Honeywell

First in Controls

Report from the West Coast

RALPH S. TORGERSON
CONSULTING ENGINEER CORRESPONDENT

ENGINEERS in California have been meeting with architects to thrash out the problem of engineering fees for school construction work. The conferences with the AIA have reached an impasse. Although not set up as groups to take action, it was hoped that some agreement could be reached.

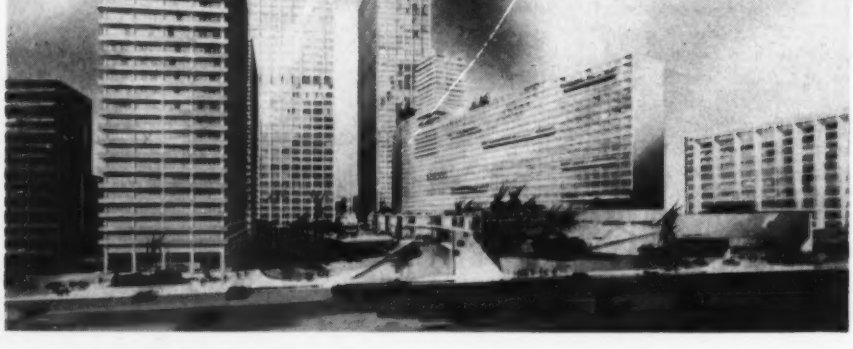
The critical question of engineering fees arose about two years ago in connection with the Los Angeles City school district. Engineering groups sought to have the Southern California chapter of AIA take some formal action to have engineering fees specifically stated in the contracts. It was felt that by setting up these fees in the contract, chiseling could be largely eliminated. The architects took the stand, however, that having the prime contract on school construction work, they had the right to negotiate engineering fees.

Earthquakes and the Field Bill

Some historical background should help to explain the problem. Following the Long Beach earthquake on March 10, 1933, investigation showed that many schools had been poorly designed and built. As a result, the California legislature passed the Field Bill, which set up minimum requirements for school construction. Los Angeles was particularly concerned with what happened in Long Beach, and in an attempt to secure better engineering, the school administration drew up a standard prime contract which provided for an 8 percent fee and further specified the fees and requirements for structural, mechanical, and electrical engineering.

In 1955, a major revision was made in the Los Angeles school district prime contract form, deleting from the contract any reference to specific fee payments for consulting engineer professional services. This action by the school district upset the entire engineering fee situation and opened the gate to the possibility of widespread chiseling by architects. The Los Angeles decision was of major importance as that city's school construction volume is so large that any action taken tended to serve as a state-wide pattern.

To their credit, most of the



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MILWAUKEE, WIS., Reinke & Schomann, Inc.

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MUNCIE, IND., Indiana Bridge Co.

NEW ORLEANS, LA., Holzer Sheet Metal Wks.

OKLAHOMA CITY, OKLA., Bissell Builders Supply Company

OMAHA, NEB., Olson Bros., Inc.

PERTH AMBOY, N. J., Chris Andersen Erecting Co.

PHILADELPHIA, PA., Wm. C. Kulzer Company

PHOENIX, ARIZ., Allison Steel Mfg. Co.

PORTLAND, ORE., Portland Wire & Iron Works

PORTSMOUTH, VA., Craddock Sheet Metal & Roofing Co.

QUINCY, ILL., Michelmann Steel Const. Co.

ST. LOUIS, MO., Mississippi Valley Struct. Steel Co.

ST. LOUIS, MO., Stupp Bros. Bridge & Iron Co.

SAN DIEGO, CALIF., Chambers Steel Const. Corp.

SAN FRANCISCO, CALIF., The Brookman Co., Inc.

SAN FRANCISCO, CALIF., Mitchell Steel Inc.

SEATTLE, WASH., Leckenby Struct. Steel Co.

SHREVEPORT, LA., H. H. Bain Co.

SPRINGFIELD, MO., Paul Mueller Company

SYRACUSE, N. Y., Joseph Cashier & Co. Inc.

TERRE HAUTE, IND., Hartmann Company Inc.

TRENTON, N. J., R. A. Steelman Company

TULSA, OKLA., Bissell Builders Supply Company

VICTORIA, TEXAS, Sechrist-Hall Co.

WILMINGTON, DEL., James Cullen Company

WILMINGTON, DEL., Union Wholesale Company

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Q-FLOOR—the original structural subfloor with electrical availability.

Q-DECK—steel roof deck to meet every span and load requirement.

Q-PANELS—an insulated wall-building unit with architectural beauty.

GALBESTOS—the improved protected metal roofing and siding now available in attractive colors.

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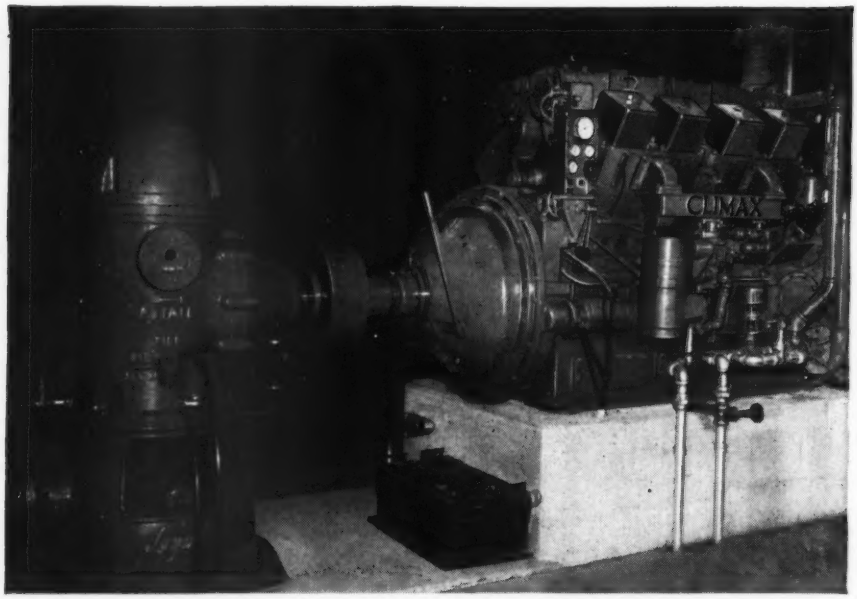


IMPORTANT FACTS ABOUT CLIMAX STANDBY ENGINES!!

CHOICE OF FUELS—
All models operate with equal efficiency on gas, butane or gasoline.

FAST, EASY STARTING—
Climax engines take over the complete load within seconds after normal utility power fails. If the starting system is manual, you merely press a button on the instrument panel...if automatic, the engine starts immediately.

SIMPLE TO OPERATE—
All instruments and controls are located at the sides of the engines . . . easy to read . . . easy to adjust.

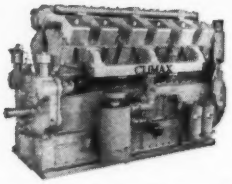
SIMPLE TO MAINTAIN—
Accessories are within "arm's reach" to allow quick inspection and adjustment. Crankcases and engine bases have large hand holes on each side for easy access to all working parts.

SAFETY PROTECTED—
Safety devices are standard equipment on all models and automatically protect the engines against high water temperature and low oil pressure. An overspeed governor can also be furnished, if required.

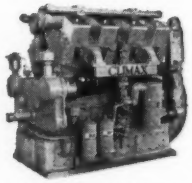
ACCESSORIES—
Various types of cooling and starting systems, mufflers, etc. are available to make each engine suitable for a particular application.

LONG ENGINE LIFE—
Climax engines are constructed of the finest metals, alloys and component parts available. Any model will give years of service if properly maintained.

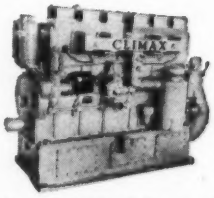
Write today for complete information, bulletins or engineering consultation



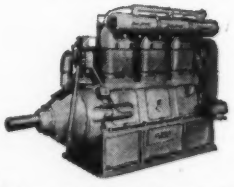
V-125—12 cylinder, 605 max. H.P. at 1200 R. P. M.
V-122—12 cylinder, 520 max. H.P. at 1200 R. P. M.



V-85—8 cylinder, 390 max. H.P. at 1200 R. P. M.
V-80—8 cylinder, 340 max. H.P. at 1200 R. P. M.



K-75—6 cylinder, 302 max. H.P. at 1200 R. P. M.
K-67—6 cylinder, 265 max. H.P. at 1200 R. P. M.



R-165—6 cylinder, 192 max. H.P. at 1200 R. P. M.
R-110—4 cylinder, 130 max. H.P. at 1200 R. P. M.

CLIMAX ENGINE MANUFACTURING CO.
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Factory—CLINTON, IOWA • *District Office*—DALLAS, TEXAS
In Canada—Canadian Fairbanks-Morse Co., Ltd., Montreal and 16 Branches

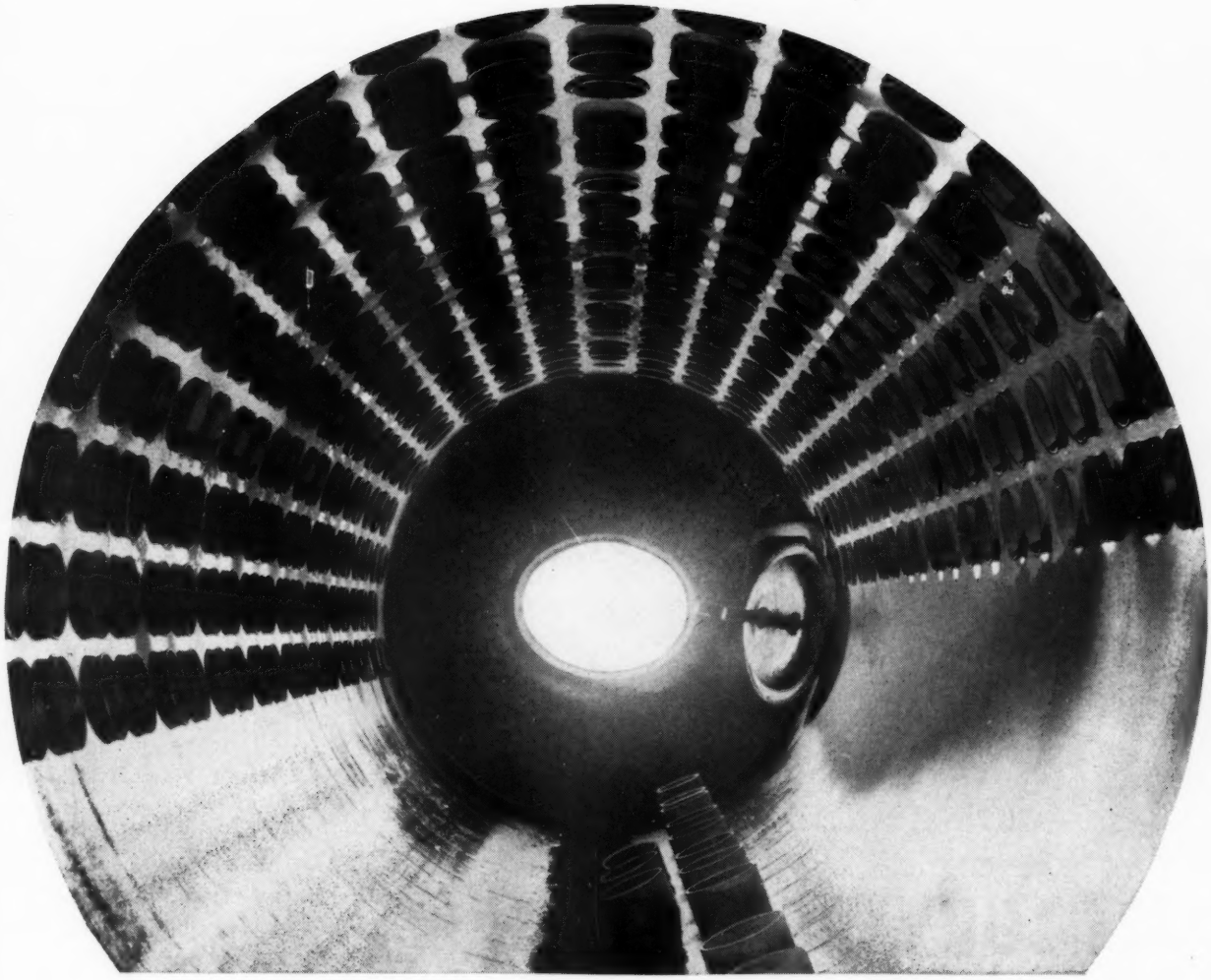
architects have not chiseled on fees for school work, and the Southern California chapter of AIA has discouraged the practice. However, there is always a possibility that a situation might develop where fee shopping could become a real problem.

The engineering profession, aware of the dangerous possibilities, has been negotiating with the architects for a state-wide agreement on standard contracts with architects for structural, mechanical and electrical engineering for school work which would specify definite fees. This would restore the stability embodied in the former Los Angeles school district prime contract revised in 1955. The school district would not be a party to the revised standard contract form, which is the subject of conference with the architects.

The architects object to a state-wide agreement on fees and feel that it is a matter of local negotiation. They also contend that as prime contractors they have an equal right in negotiating subcontracts.

Telephone Directory Advertising

An interesting experiment is being tried out by the Consulting Engineers Association of California in telephone directory advertising. The Los Angeles yellow page advertising directory now carries below the heading of the Consulting Engineers Association of California listings of members under the divisions of Civil, Electrical, Mechanical, and Structural. A similar arrangement is to be made for the San Francisco and Bay Cities telephone directory. Members also are listed separately. The cost per member listed is about $15 per year. It is a purely voluntary arrangement with the members, but the plan has been so well received that it is expected the Los Angeles representation in the directory will include nearly 100 percent of the membership at the time of the next listing. The results have



NOBODY WAS SURPRISED

When this mud drum was opened for inspection, it looked just as everyone expected it would—clean as a whistle, completely free of sludge and scale—after nine months of treatment with Dearborn Formula 659. That's product dependability.

Formula 659 contains a patented* Dearborn Polyamide Anti-Foam that provides protection throughout the entire water-steam cycle. In addition to improving steam quality, Formula 659 also conditions sludge, reduces blowdown requirements, and controls corrosion.

Compatible with other water treating reagents, Formula 659 is a neutral product which imparts no alkalinity to boiler water—nor will it increase carbon dioxide content of steam.

Formula 659 will mean important savings in your plant—see your Dearborn Engineer.

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HOW FORMULA 659 WORKS

FORMULA 659 improves steam quality by reducing carry-over to a minimum.

FORMULA 659 keeps sludge in a fluid, non-adherent form.

FORMULA 659 permits higher boiler water concentrations, thus reducing blowdown.

FORMULA 659 helps protect against corrosion in the water-steam cycle.

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Name.....*Title*.....

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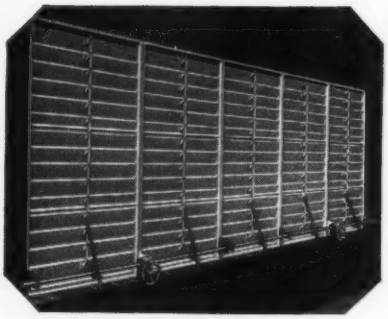
Dearborn®

...a leader in water conditioning and corrosion control for 70 years

Butyl rubber has inherent characteristics that make... quires special know how and special equipment on the

BURT LOUVERS ARE VITAL VENTILATING EQUIPMENT

Air removed from a building with gravity or fan ventilators must be replaced. Burt Wall Louvers, with fixed or adjustable blades, provide efficient, weatherproof air inlets. The Burt line is complete, from general purpose models to industrial types and includes removable screens, louver operators and other accessories. Burt experience and specialized equipment also provide every facility to economically construct special units when required.



Series of Burt Adjustable Louvers

Send for **FREE** *Data Book!*

Write for Burt Data Book SPV-17. It supplies quick data on Burt's complete line of modern Wall Louvers.

FAN & GRAVITY VENTILATORS • LOUVERS • SHEET METAL SPECIALTIES

The Burt Manufacturing Company

919 S. High Street Akron 11, Ohio

MEMBER POWER FAN MANUFACTURERS ASSOCIATION

been very satisfactory for the individual members, and engineers outside of the Association have become interested enough to make inquiries about membership.

Owner-Engineer Contract

The Standard Form of Agreement between Owner and Engineer adopted by the Consulting Engineers Association of California, in 1956, has come into increasingly wider use. The form has been generally satisfactory in all its provisions, but when revised it probably will include a reference to "architect" as well as "owner" throughout the form.

Construction Boom Continues

Construction activity in Southern California has again picked up momentum with the settlement of the 47-day plumbers' strike. The long strike had slowed down construction until it was almost at a standstill.

Recent announcements indicate Los Angeles will continue to be a center of activity for big construction projects. Examples are the Ambassador International, which will be located on 21 acres stretching between Wilshire Boulevard and Eighth Street, and the development of the Twentieth Century Fox studio property in West Los Angeles.

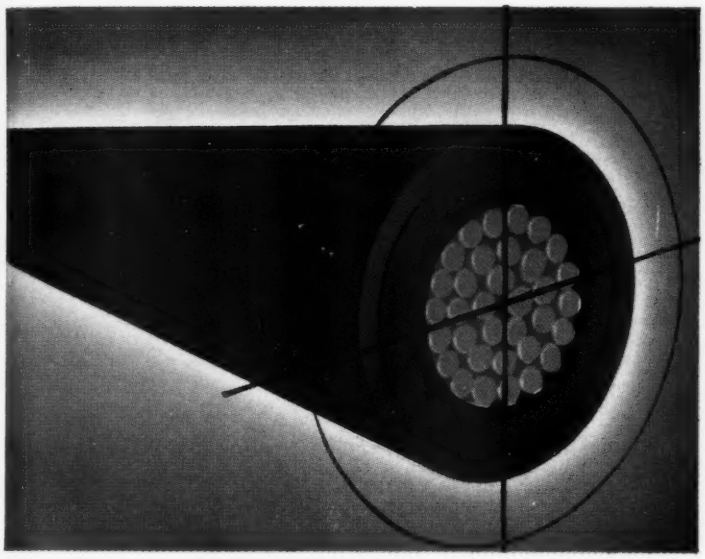
Master plans for Ambassador International, a Schine Enterprise's property, have been prepared by Daniel, Mann, Johnson and Mendenhall, architects and engineers. They call for the ultimate construction of seven office buildings, a new 2000-room hotel, a merchandise mart, a heliport, exhibition facilities, and underground parking for 2700 cars. To insure the open character of the site, a large lake, beautifully landscaped, will provide a typically California atmosphere for the entire development. Initial planning contemplates the construction of a 25-story, 500,000 sq ft office building fronting on Wilshire Boulevard, and a 450-600 room addition to the present hotel.

Butyl rubber has inherent characteristics that make it an ideal insulating material for high temperature, high voltage wire and cable. It has outstanding resistance to heat, ozone and moisture.

To take full advantage of these characteristics requires special know-how and special equipment on the part of the wire and cable manufacturer. Here are eight things which National Electric does to get the best out of Butyl rubber and make NE Butyl insulated wire and cable the most dependable on the market.

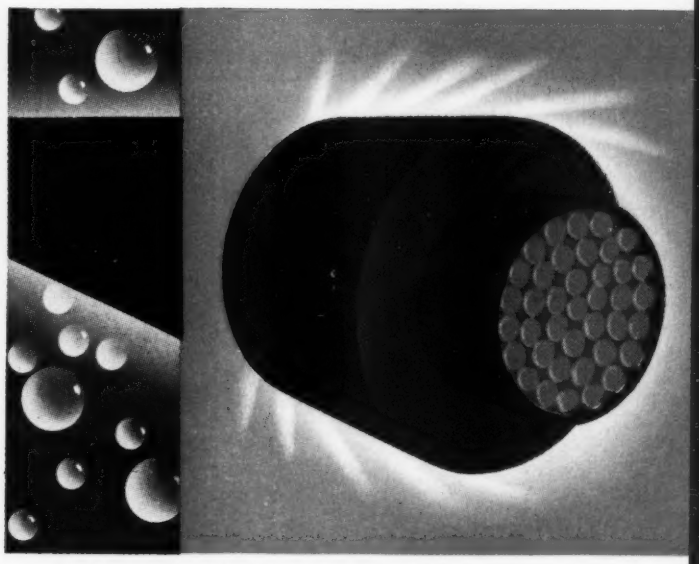
National Electric Products

Pittsburgh, Pa.: 2 Plants • 12 Warehouses • 41 Sales Offices



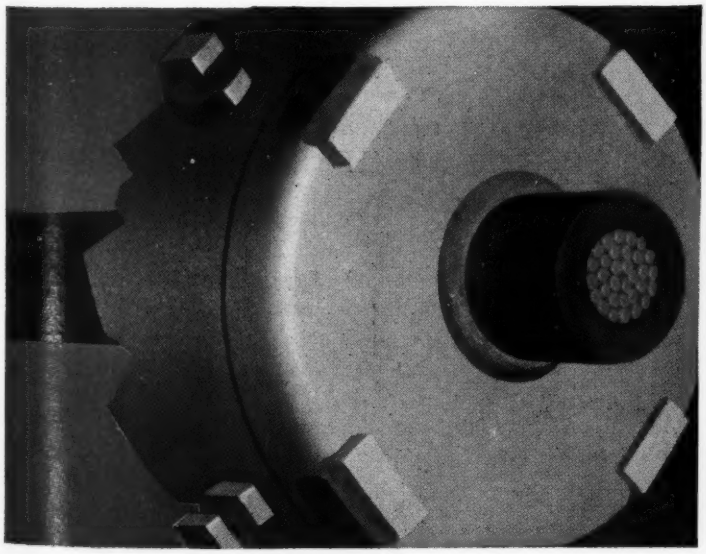
3. Controlled Concentricity

Every foot of cable is checked by a special monitoring station to maintain a perfectly centered core and uniform wall thickness before the material enters the vulcanizing chamber.



4. Water Cushion Processing

NE Butyl Rubber rides into the vulcanizing chamber through a high pressure water seal that molds the rubber uniformly onto the cable, impregnates the interstices of the shielding tape before vulcanization.



7. Pressure Vessel Cooling

Perhaps the most important part of the Nepco process. NE Butyl insulated cable is slowly cooled in a second pressure vessel under the same pressure at which it was vulcanized. This cooling under high pressure forces gaseous by-products out of the insulation . . . permits the use of volatile vulcanizing agents which leave no harmful residuals behind.

The inherent inertness of the Butyl rubber polymer permits the insulation to be compounded and vulcanized to a much tougher and mechanically stronger material.

A typical National Electric Butyl formulation has at least twice the tensile strength specified for an oil base insulation and will maintain this margin of superiority during long term accelerated service tests. That's why when you plan to install Butyl rubber insulated wire and cable . . . don't say *any* wire . . . say NE Wire.

. . . say NE wire

Atoms in Action

ARCHITECT - ENGINEER firms experienced in reactor work have been invited by the Atomic Energy Commission to submit proposals for the engineering design of a natural uranium, gas cooled, graphite moderated nuclear electric power plant of 40,000-electrical-kw capacity. The Commission will submit the report on the design, including cost estimates and schedule of construction, to the Joint Committee on Atomic Energy by April 1st of next year. Congress has authorized this portion of the initial work but has not authorized construction of a prototype plant.

CARNEGIE INSTITUTE of Technology plans to offer courses in nuclear engineering leading to a master's degree for students with a bachelor's degree in mechanical, chemical, or metallurgical engineering or in physics, mathematics, or chemistry. The program probably will not start until September of 1958. Carnegie is one of the six institutions participating in the AEC's ORSORT (Oak Ridge School of Reactor Technology) program.

A CONTRACT for study of the applicability of selected combinations of nuclear energy-saline water distillation processes has been awarded to The Fluor Corp., Ltd., Los Angeles, by the U. S. Department of the Interior. Object is to analyze theoretically the economics and technical feasibility of utilizing nuclear energy either as a heat or electrical power source in combination with salt water conversion distillation processes.

WALTER KIDDE Constructors, Inc. has been awarded the contract for architectural design and engineering of supporting office and laboratory facilities for Princeton University's thermonuclear Model C Stellarator research project. The contract also includes preparation of a master plan to arrange Stellarator project buildings and services according to present and possible future requirements. In its initial stage, the project will occupy about 30 acres of the Forrestal Research Center's site in Plainsboro Township, five miles east of Princeton. Work of the Princeton group is part of the AEC's Project Sherwood, development of a nuclear fusion system.

SCIENTISTS at Union Carbide's laboratory in Sterling Forest, New York, have begun investigations on properties of various materials bombarded by high energy particles from the million-volt Van de Graaff accelerator installed recently. The laboratory, temporarily housed in a renovated building, will be part of the nuclear and ore research center to be constructed in the Forest. Ground has been broken and work is expected to start on the buildings soon. The Osborn Engineering Co., Cleveland, Ohio, is architect-engineer for the center.

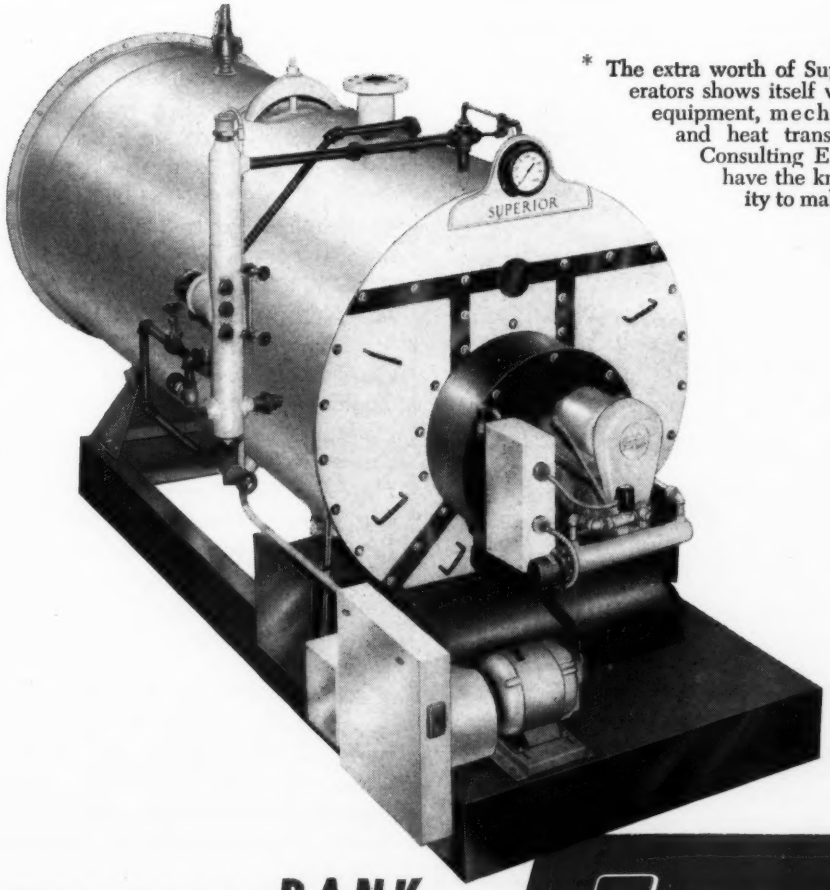
UNITED ENGINEERS & Constructors, Inc., Philadelphia, will design a boiling reactor facility to be erected at Argonne National Laboratory's Idaho site. Purpose of the plant will be to investigate full-scale boiling water power reactor systems operating at pressures up to 2000 psi and developing up to 200,000 kw of heat under varying conditions.

MORE THAN 500 organizations are now using radioisotopes in radiographic testing, according to the AEC. Reactor-produced cobalt-60, cesium-137, and iridium-192 are used in much the same way that radium formerly was used. Cobalt-60, equivalent in radiation intensity to $20,000 worth of radium, can be delivered for about $100, and its gamma rays will penetrate thicker sections of steel than will those of radium. Small radioisotope sources of high radiation intensity permit flexibility of operation as compared with fixed X-ray installations. The AEC's 22nd Semiannual Report to Congress lists as typical uses in the oil industry, tracer applications for such drilling and production operations as acidizing control and evaluation; injectivity profiles; interwell tracing; cement top location; cement channeling; casing seat channeling; casing leaks; permeability surveys; locating fractures; and locating lost circulation.

ANOTHER PREDICTION on how much nuclear power how soon — this time from W. Kenneth Davis of AEC: "We [the AEC] have recently made an attempt to estimate the rate of growth of the nuclear power industry in the United States . . . This projection suggests that there will be about one million electrical kilowatts . . . in operation five years from now, about 7½ million in 10 years, 43 million in 15 years, and 133 million in 20 years

the man to ask

is your ENGINEER*



* The extra worth of Superior Steam Generators shows itself when evaluation of equipment, mechanical principles, and heat transfer are made by Consulting Engineers . . . who have the knowledge and ability to make such evaluation.

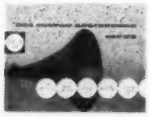
for performance you can **BANK** on

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

SUPERIOR
STEAM GENERATORS

ARE THEY COMING TO YOU FOR IDEAS ON SOUND?

1. RCA School Sound Systems



2. RCA "Arena-Size" Sound

3. RCA Hotel Sound Systems

4. RCA Sound in Industry

5. RCA Church Sound Systems

...then get all the help RCA can give you

Your project may be a school or a hotel, a manufacturing plant or an arena. Whatever its nature, RCA is ready to backstop your sound system work from the time you begin planning with a client until the entire RCA System is fully tested and in operation. The brochures you can obtain by filling out the coupon below will show how you can take advantage of RCA's pioneering leadership in sound to assure your client of dependability wherever sound plays a part. You'll go on to work with an RCA Sound Distributor . . . an all-round expert on the latest in RCA Equipment, the newest in sound techniques. He is listed in the Yellow Pages of your telephone book under the "Public Address and Sound Systems" listing. Send for your RCA brochures . . . get the advice of your RCA Sound Distributor . . . to make a sound job outstanding.

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Please send the RCA Sound brochures checked below.
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Company _____
Address _____
City _____ Zone _____ State _____

— about the same capacity as the total electric generating capacity in the U.S. at the present time. However, by that time, 1977, the nuclear capacity will still only be about 1/4 of the total electric generating capacity."

A CLOSED-CIRCUIT, three dimensional color television system has been developed by General Electric for remote servicing of reactors used in development of a nuclear aircraft propulsion system at Idaho Falls, Idaho. It permits color-coding of parts for reactor components and provides the precise depth perception required for their correct positioning. The camera is equipped with a dual-optical system having perspective similar to that of the two eyes of the observer, who wears polarizing glasses to attain the 3-D effect.

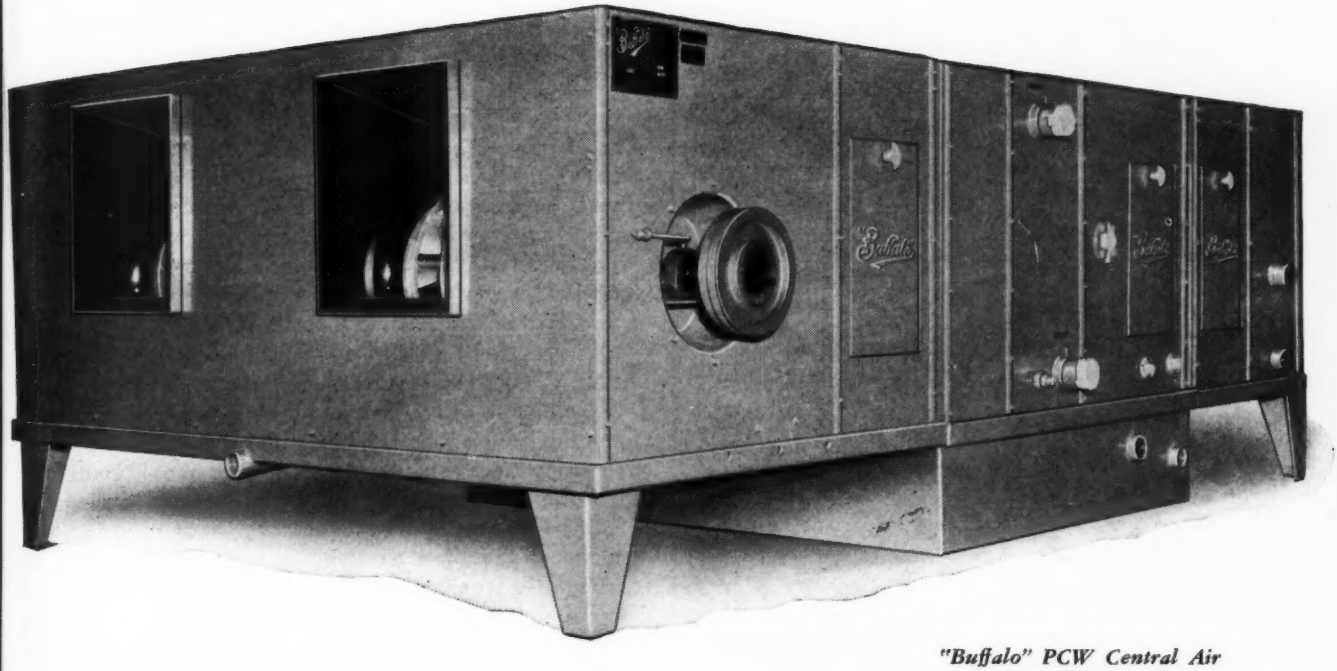
APPLICATIONS are being accepted for Atomic Energy Commission special fellowships in nuclear technology. The fellowships, carrying stipends of $1800 plus tuition and dependency allowances, are open to students with a bachelor's degree in engineering, chemistry, mathematics, or physics who have completed a course in differential equations. The applicant must first be accepted as a candidate for an advanced degree from a participating institution. Forms are obtainable from the Fellowship Office, Oak Ridge Institute of Nuclear Studies, P.O. Box 117, Oak Ridge, Tenn.

THE 700 HOUR TEST of the Army Package Power Reactor at Fort Belvoir, Va., has been completed successfully with shutdowns for repair and adjustment totaling only eight hours. During more than 600 hours of the test, electricity was generated at a rate exceeding the design output. A total of 1,181,000 kilowatt-hours was produced — enough to furnish 300 to 400 homes with electric power for one year.

AS CALLED FOR in Tennessee's 1957 Atomic Development and Coordination Act, an eight-member Advisory Committee on Atomic Energy has been established. Chairman is Howard P. Preston, president of Hamilton National Bank of Knoxville. Other members are Edward J. Boling, State Director of the Budget; Dr. Quill E. Cope, State Commissioner of Education; J. M. Deaderick, American Lava Corp.; Dr. Nicholas R. DiLuzio, University of Tennessee College of Medicine; Dr. James A. Lane, Oak Ridge National Laboratory; Dr. Edward R. McCrady, University of the South; and Dr. Webster Pendergrass, University of Tennesse College of Agriculture.

A RADIOISOTOPE-EXCITED lamp that provides marking illumination for periods up to 10 years, with no power or maintenance required, has been developed by United States Radium Corp., New Jersey. By using different phosphors of krypton-85, the lamps can be furnished to emit blue, green, yellow, or orange-red illumination.

35 TONS of steel bb's provide the shielding in a new hot cell at Westinghouse Material Engineering Department's radiation and nucleonics laboratory. The bb's fill the 15-in. space between the 1/2-in. thick steel walls of the cell. Openings near the base of the wall make it possible to drain out the bb's so that the hot cell may be moved easily. The cell will be used for examining effects of a



"Buffalo" PCW Central Air Conditioning Cabinet — complete facilities, including Washer section.

PERFORMANCE-PLUS for your CENTRAL-SYSTEM AIR CONDITIONING JOBS!

"Buffalo" Central Air Conditioning Cabinets are built to the same strict "Q" Factor* standards as "Buffalo" Fans — and are everywhere justifying this "extra" construction by completely satisfactory performance. "Buffalo" features include:

HEAVY-DUTY SECTIONALIZED CABINETS—rigid and strong for years of continuous service—properly insulated — interchangeable and demountable for simple installation and servicing, or later addition of sections.

QUIET, STABLE PERFORMING FANS—"Buffalo" mixed-flow fans on oversize hollow shaft, permitting as many as 4 fans in parallel supplying different systems efficiently and without pulsation. Stability over a wide operating range.

QUALITY AEROFIN COILS AND "BUFFALO" PUMPS — plus easily removable filters, outside lubrication, manual or automatic damper control — available in vertical or horizontal models. Write for Bulletin AC-120.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

BUFFALO FORGE COMPANY

BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

Another first by WEBSTER

Flame Retention

RING

GAS BURNER

Through a *new* application of an old basic principle WEBSTER now offers unequalled stability in an non-premixing ring gas burner.

Presently packaged as Series H, Forced Draft for Gas, Rotary Oil or Combination this revolutionary development will soon be available in other variations.

Write for Series B13 literature.

Some Territories Open

The
WEBSTER ENGINEERING *Company*
TULSA 16, OKLAHOMA

Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

nuclear environment on reactor materials, studying atomic radiations for industrial processes, and related research.

SIR EDWIN PLOWDEN, chairman of the United Kingdom Atomic Energy Authority, and Lewis J. Strauss, chairman of the U.S. Atomic Energy Commission, each will discuss his country's program for development of atomic energy at an all-conference banquet at the Waldorf-Astoria Hotel, New York City, on Oct. 29. The banquet is part of the week-long activities centered around the 1957 Trade Fair of the Atomic Industry, Oct. 28-31.

A NEW URANIUM compound, uranly/protoporphyrin, made up of uranium and a biological chemical that forms the basis of hemoglobin, may be able to kill cancers by making them virtually explode from inside. Research by Dr. Robert E. Bases, of New York University College of Medicine, as reported in the journal Science, points toward the theory that if a cancerous growth can be made to concentrate uranium inside its borders, it could be bombarded by neutrons. These neutrons would then cause a chain reaction with the resulting fission particles destroying the tumor.

THE INTERNATIONAL Organization for Standardization, which met at Geneva, Switzerland, agreed on six areas of work in the atomic field:

¶ Development of a tri-lingual glossary of terms applicable to nuclear energy.
¶ Development of a warning symbol for danger.
¶ Development of drawing symbols.
¶ International recommendations for measurement of and protection against radiation.
¶ Adoption of measurement units.
¶ Development of internationally acceptable guides for safe design, operation, and maintenance of reactors.

A WEEK AFTER signing a licensing agreement with a Belgium manufacturer for production and sale of its nuclear reactors (see "Atoms in Action," Sept.), Westinghouse Electric signed a similar pact with Fiat, SPA, of Italy. Next step is signing of agreements with concerns in West Germany and Japan.

"GLOSSARY OF TERMS in Nuclear Science and Technology," published by the American Society of Mechanical Engineers, has been approved by the American Standards Association as an American Standard. It includes three categories of terms: those invented expressly for the field of nuclear energy; those borrowed from other fields and employed here with different meanings; and those used elsewhere which may be unfamiliar to nuclear workers. The 188-page book is available from ASME at 29 West 39th St., New York City, for $5.00.

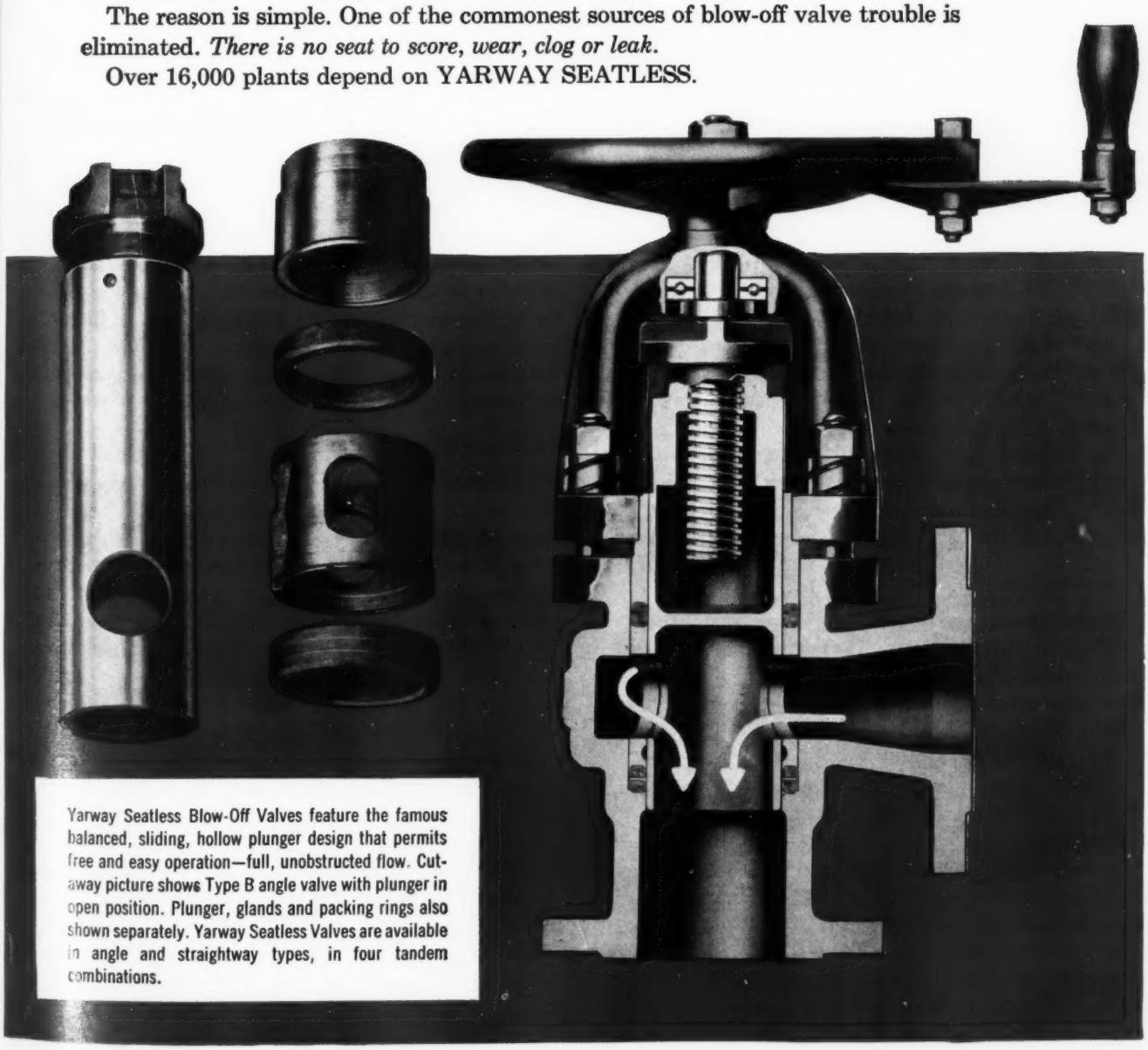
TO ENCOURAGE qualified organizations to sponsor research and development programs, the Atomic Energy Commission has amended its access permit regulations to extend access to those making a substantial financial contribution or furnishing scientific, engineering, or other professional services directly related to comparative evaluation of fission and fusion processes for production of power or for a study or research and development program in the thermonuclear field. ▲▲

seatless means savings

For nearly 50 years boiler plants in low and medium pressure ranges have been saving maintenance time and down-time thanks to dependable, trouble-free blow-down service from Yarway Seatless Blow-Off Valves.

The reason is simple. One of the commonest sources of blow-off valve trouble is eliminated. *There is no seat to score, wear, clog or leak.*

Over 16,000 plants depend on YARWAY SEATLESS.



Yarway Seatless Blow-Off Valves feature the famous balanced, sliding, hollow plunger design that permits free and easy operation—full, unobstructed flow. Cut-away picture shows Type B angle valve with plunger in open position. Plunger, glands and packing rings also shown separately. Yarway Seatless Valves are available in angle and straightway types, in four tandem combinations.

For information on Yarway Seatless Valves, sizes, materials, pressures, etc., write

YARNALL-WARING COMPANY 106 Mermaid Ave., Philadelphia 18, Pa.
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YARWAY SEATLESS ...a good way to specify blow-off valves

MORRIS D. HOOVEN

Mr. Hooven, electrical engineer for the Public Service Electric and Gas Company, Newark, N.J., is president of the Engineers' Council for Professional Development. As such he is much involved in the problems associated with society unity. He is a Fellow of AIEE and a member of IRE, ASME, and NSPE. He holds an honorary Doctor of Science degree from the Newark College of Engineering. He received his B.Sc. magna cum laude from Bucknell in '20.

Can We Be Put Back Together Again?

THE AIEE APPROACH to unity, printed on the opposite page, is in essence a very simple one. It says that each of the major divisions of the profession should concentrate its efforts on the technological segment of the profession which it represents; that it should be recognized that there are several existing bodies doing work for the entire profession; that the areas in which these bodies work should be closely defined; and that full support should be given by all segments of the profession to the groups operating within these general areas. The intent is to accomplish unity of the profession.

The Greatest Stake in Unity

The designation of "consulting engineer" usually implies that this particular practitioner has many clients rather than the single client (employer) which most engineers have. Consulting engineers as a group cut across the several disciplines into which the engineering profession is divided, and they would seem to be among those who have the greatest stake in achieving the maximum possible degree of professional unity.

There can be no misunderstanding as to the intense desire of engineers in general to belong to one association. AIEE President Coover, in his proposal, says, "I have yet to hear any engineer regardless of his society affiliation express opposition to unification . . . ." ASME President Ryan says, "At most of my meetings with ASME Sections . . . . I have been asked what progress is being made toward unity of the profession." ASCE President Lockwood says, "I have yet to encounter an individual engineer anywhere who does not desperately want real unity . . . ." There is a great surge of opinion among the membership of all societies toward unity.

A great obstacle toward the achievement of unity is the absolute sovereignty that is retained by each individual society. When a new suggestion for a unified organization arises, the mechanics of its operation must be spelled out. There have been many excellent plans proposed in the past, each one of them being dispatched toward oblivion by the fact that some particular group, some specific interest, felt that it would have to give up control of some area precious to it.

Empire Building Ambitions

President Lockwood says, "Administrative staffs of national engineering organizations usually are directed by engineers in the full-time employ of these organizations. These engineers are human too, and are therefore subject to such human foibles as professional jealousy and empire-building ambitions. This, to some degree at least, may have handicapped our national aspirations for more effective unity." It must be said, in this connection, that no member of an administrative staff would be worth his salt if he did not give his first loyalty to the particular society that employs him; therefore, progress toward unity can best be made in the area farthest removed from administrative control. This would be at the level of local engineering activity. At this level operational unity is frequently found to be an accomplished fact.

The extreme rapidity with which the profession is growing and the fragmentation of the profession into many excellent, and sometimes very large, engineering associations has added to the difficulty of the problem. There are rivalries within the profession among the societies that constitute it. These rivalries are of themselves a healthy thing, in that competition for a good technical paper between, say, AIEE and IRE undoubtedly spurs the dissemination of technical information in the electrical field.

The original, much-to-be-regretted break-up of the sole society representing all engineers during the

latter half of the last century into the four Founder Societies came about because coverage of the growing field of engineering technology did not allow room for technical papers on all subjects. Since that split of the ASCE into the four Founder Societies, it sometimes seems as if Humpty Dumpty has fallen off the wall time and time again. The fragmentation of the original shell has become so great that certain counsel of dispair can see in the future nothing but a finely powdered eggshell. However, with the inside of the egg still intact (the desire of each individual to belong to a unified organization), it is still possible to conceive of pasting the pieces of this shell back together in some fashion.

Three Responsible Bodies

The AIEE approach provides sufficient realism to make a start. All members who are concerned with intersociety affairs realize that there are three responsible bodies now acting for the whole profession in three general fields. EJC, a loose federation of many societies, has done and is doing excellent work in a generally broad technological area. ECPD, a similar loose federation, is the only group that takes on responsibility for the full intellectual development of the engineer in the United States and Canada, and thus concentrates on the educational field. NSPE, an individual-membership society, has an excellent geographical coverage and has done some extraordinarily capable work in the professional field. None of these bodies are sufficiently comprehensive. EJC and ECPD do not include, for instance, IRE, NSPE, or IAS, although steps are slowly being made to correct this situation. And NSPE is not as yet large enough to speak authoritatively for the whole profession, of which it represents about 10 percent at the moment.

The AIEE proposal recommends that each engineering society give full support to these three over-all bodies in the area that each occupies, after these areas have been closely defined so as to avoid overlapping of interests. If this should be done, it is easy to visualize three strong organizations, each covering a phase of the profession in a way that is cooperative rather than competitive. Under such a system the mechanics of joining one to the other would generate themselves.

Already there are suggestions and discussions concerning the joining of EJC and ECPD. The suggestion that NSPE, as well as other societies, join with ECPD and eventually with EJC is under full discussion in many areas. While the AIEE proposal does not give exact specifications for putting Humpty Dumpty together again, it does offer to bring together again all the king's horses and all the king's men. ▲▲

The AIEE Approach to Unity

1. *Electrical Engineering.** AIEE to provide the medium for advancement in technology in all branches of electrical engineering and to devote its efforts to this end. It is recognized that excellent services are being rendered in specialized areas of electrical technology by other societies. AIEE will cooperate with these societies. If mutually satisfactory arrangements can be effected, AIEE is agreeable to a merger into one organization for economy of operation and coordination of activities.

2. *Engineering other than Electrical.* EJC to provide the medium for coordination and cooperation on technological matters transcending the electrical field, and to present to the public the position of the engineering profession on technological matters.

For these purposes, a Federation of Societies is adequate. Accordingly, the AIEE Board proposes that, in the future, it will support and participate only in the technical activities of EJC.

3. *Engineering Education.* Engineers' Council for Professional Development (ECPD) provides the medium for guidance in engineering education (a) during high school preparation, (b) during the undergraduate and postgraduate collegiate periods, and (c) during the "engineer-in-training" period for a professional career. It could be delegated to represent the engineering profession in all educational matters.

4. *Professional Development and Economic Status.* National Society of Professional Engineers (NSPE) to provide the medium for the general promotion of the professional aspects of engineering in the eyes of the public, and be instrumental in the consequent enhancement of the economic status of engineers. The term "professional," as differentiated from technical and educational, is construed to include such activities as registration, employment practices, salaries and fees, legislation, and ethics.

5. *Coordination of Activities.* To implement this policy, the AIEE Board proposes that the several activities presently individually sponsored by these organizations be assigned according to the aforementioned delineation of scopes; namely technological (EJC), educational (ECPD), and professional (NSPE). Separation and realignment of activities into these 3 categories could eliminate present confusion and wasteful duplication of effort.

If each of the organizations establishes itself in the fields indicated, it is believed that many of the advantages desired of a "Unity" organization may be realized. Eventually, it may be possible to incorporate them into one over-all engineering association.

6. *Expansion of NSPE.* AIEE has for many years recommended to its members that they should take steps to register as professional engineers. NSPE should put itself in a position to represent the profession more completely by expanding its individual membership organization to include those qualified members of the profession whose work does not by law require registration as well as registered engineers. Under such conditions, the AIEE Board proposes to recommend that all its members affiliate with NSPE.

* Mr. Coover made this proposal to AIEE, hence he refers here only to electrical engineering. It is to be understood that civil engineers would substitute ASCE, mechanical engineers, ASME, etc. for the AIEE in paragraph 1.

Aerojet-General Corp.

SAMUEL HOBBS, Consulting Engineer
Los Angeles, California

and

F. THOMAS COLLINS, Consulting Engineer
San Gabriel, California

Tips on Tilt-Up Construction

Sam Hobbs, now associated with the engineering office of Clyde C. Kennedy, in Los Angeles, was graduated from the Thayer School of Engineering at Dartmouth, in 1913. Early in his career he joined the Portland Cement Association and after four years in the Boston office he was moved to California. He has written a number of magazine articles and is well known in engineering and construction circles on the West Coast. He also is active in technical societies.

F. Thomas Collins is a consulting engineer in private practice specializing in the design of industrial and commercial buildings by means of the tilt-up method of construction. He has a mechanical engineering degree from Stanford University. Besides practicing as a consulting engineer, Mr. Collins has given special classes in tilt-up construction throughout the United States. He has written a new design manual for tilt-up buildings which will be published this fall.

TILT-UP CONCRETE WALL construction became important in the early stages of the last war, when economies in material and labor were essential. This is easily understood when one recognizes that equivalent sections built in the horizontal position at ground level may require only a small fraction, perhaps 10 percent, of the material and labor necessary to build and brace wall forms for construction in the conventional vertical position.

Moreover, the proper placement of concrete in wall forms involves batch-by-batch elevation of fresh concrete. Good placing equipment and skilled labor under competent supervision are required to secure uniformity, high quality of work, and satisfactory surface appearance.

Field for Tilt-Up

It is apparent that tilt-up construction will be most economical when the obvious savings of flat ground-level casting are accompanied by efficient erection of the precast wall panels. Crane operation and rigging crews are expensive, so the real economy of tilt-up may be realized when the method is applied to structures carefully laid out and planned and to construction executed efficiently. This requires or-

derly scheduling of layout, casting, curing, erection, bracing, joining, and completion. In particular it is important to minimize delay and unnecessary movement of cranes and crews so that wall erection may be a continuous operation carried on at a steady and satisfactory rate, releasing the expensive equipment in the shortest time commensurate with accuracy, good workmanship, and good appearance.

Early Type of Tilt-Up

Early success with tilt-up construction for low-cost buildings resulted from application of the method to simple rectangular structures such as warehouses. Commonly a ground floor slab served as the casting bed for the tilt-up wall panels. Frequently the width of the building permitted a layout with a clear middle aisle which permitted truck mixers, and later the crane, to enter over a ramp and operate directly from the floor slab to deliver concrete to the forms and to erect the wall panels. This system usually provided for casting the panels singly in rows convenient to the final positioning.

Extension of Field

It was soon found that tilt-up could be used with economy in more complex situations. In narrower buildings or in those where the ground floor was not available for use in the erection period, the crane could be operated in a clear, level space outside the wall perimeter, picking up the panels from the casting floor. When necessary because of space limitations, it was found feasible to cast wall panels in series, one over another, an operation known as stacking. Whether cast singly or in stacks, the use of a separator or parting compound permitted the lifting of a panel from contact with the casting bed or with the panel beneath.

As experience developed, it was found that in layouts where floor space was not available for casting, it was feasible to use auxiliary casting beds outside the wall lines but accessible to the crane. These beds were prepared with minimum thickness of surfacing to serve the temporary purpose of panel production. Developments such as these led to a steady widening of the field of building types to which tilt-up methods could be applied profitably.

As might be expected, the simplest layouts were those most commonly used in the early stage of development. Typically, the early layout provided for wall panels spaced so that concrete wall columns, cast in place, would close the gaps and complete the wall. An alternate method was to place wall panels between columns of structural steel.

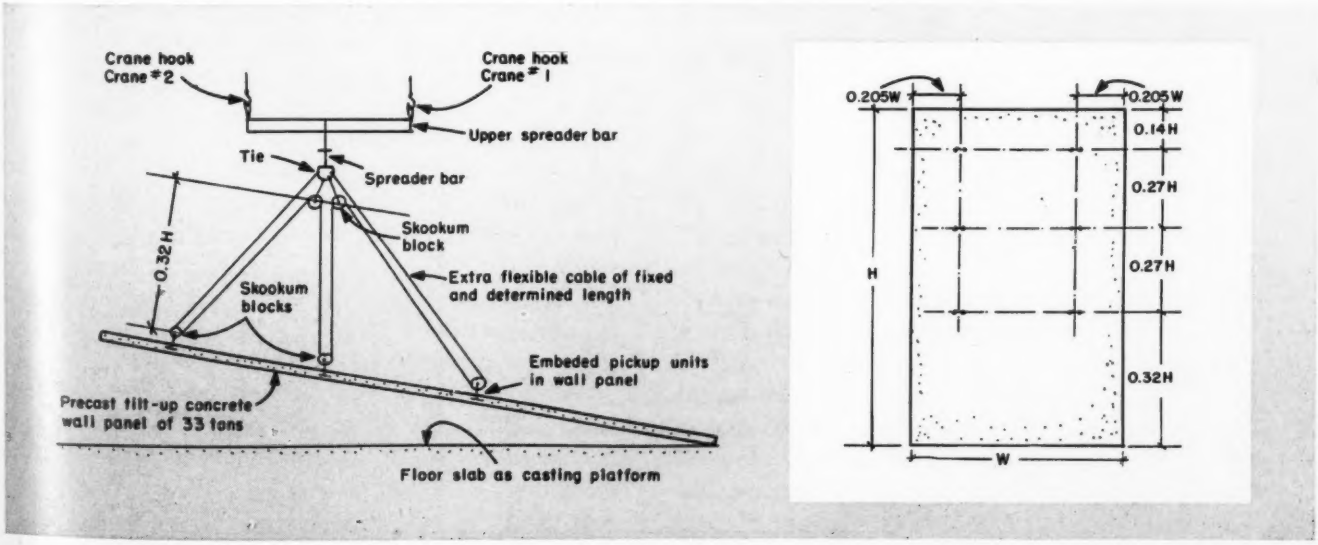
Variations developed rapidly. Among those frequently favored were: panels cast with integral end column sections; panels joined flush on the exterior face and offset to form keys for interior columns cast in place; and panels cast with a column at mid-point, joined at mid-span between columns.

Precast Columns and Frames

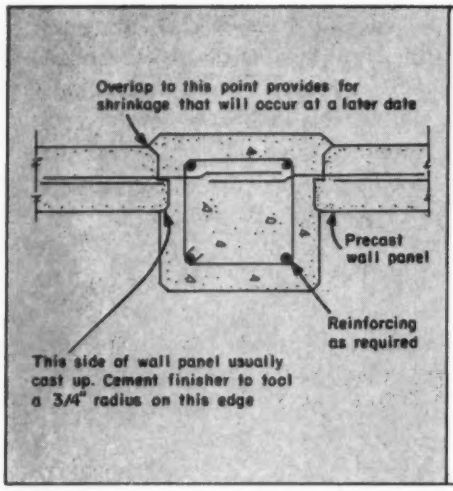
The use of precast columns and frames as supporting members was a logical step in the further application of tilt-up construction. This stimulated the development of satisfactory welding methods for the connection of wall panels to columns and frames. The common solution of the problem was to provide matching inserts in the joined members, welding these at intervals such as at the top, bottom, and mid-point of a story height.

Erection Methods

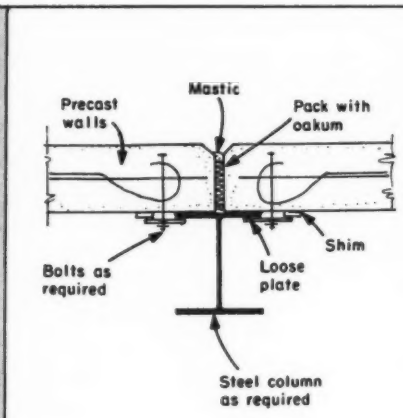
Accompanying the development of assembly methods, there was experimentation and proof by use in the field of new erection techniques. In early application, panels of low height and moderate weight generally were lifted by attaching cables to hooks or loops anchored in the top edge of the panels. As



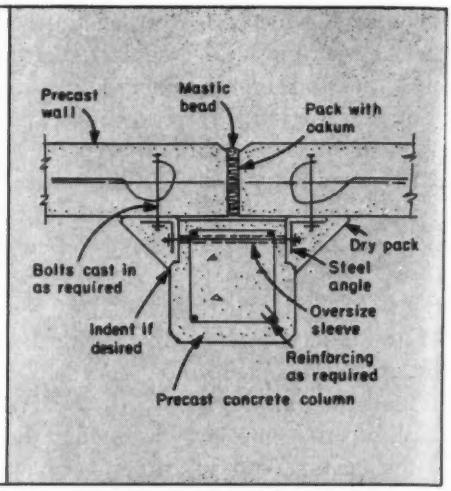
PICKUP POSITION FOR LARGE CONCRETE PANELS AS DESIGNED BY J. L. PETERSON, STRUCTURAL ENGINEER.


Overlap to this point provides for shrinkage that will occur at a later date
Precast wall panel
Reinforcing as required
This side of wall panel usually cast up. Cement finisher to tool a 3/4" radius on this edge

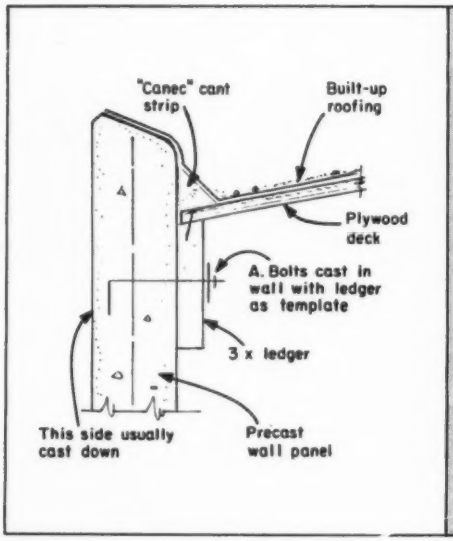
JOINING A CAST IN PLACE COLUMN



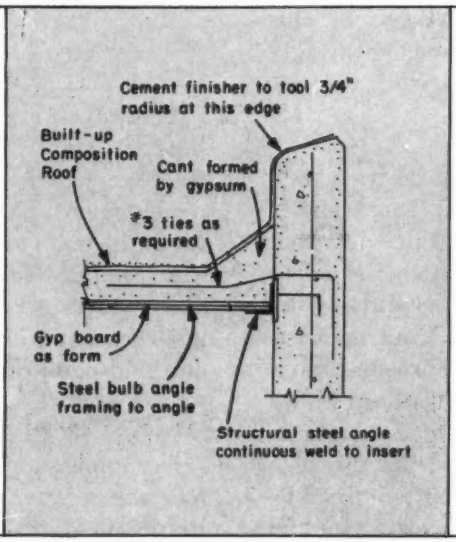
A STRUCTURAL STEEL COLUMN JOINT



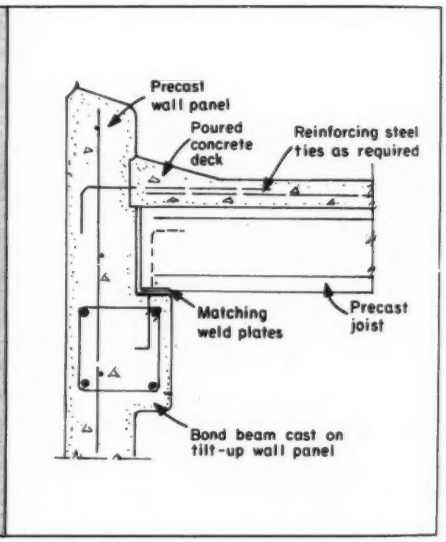
A PRECAST CONCRETE COLUMN JOINT



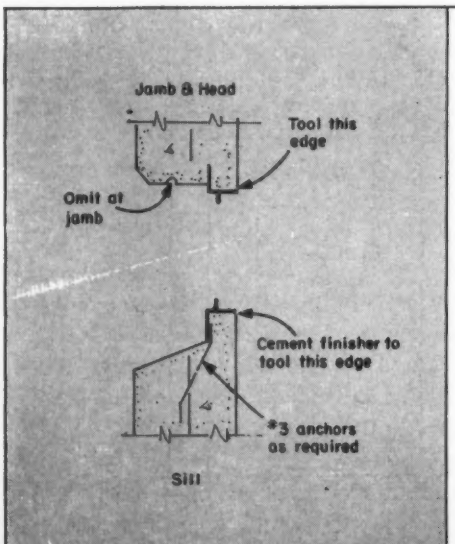
WALL TO WOOD ROOF JOINERY DETAIL


Cement finisher to tool 3/4" radius at this edge
Built-up Composition Roof
Cant formed by gypsum
#3 ties as required
Gyp board as form
Steel bulb angle framing to angle
Structural steel angle continuous weld to insert

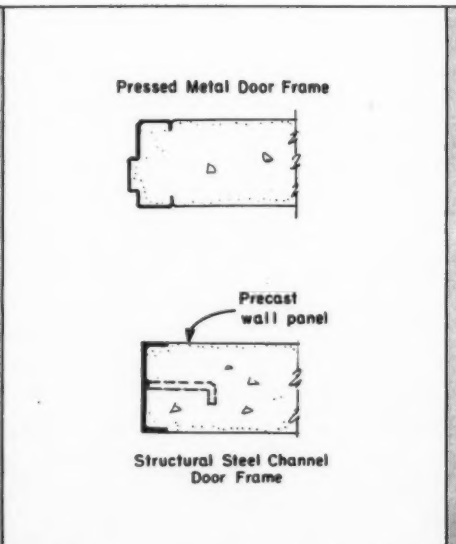
WALL-GYPSUM ROOF JOINERY DETAIL



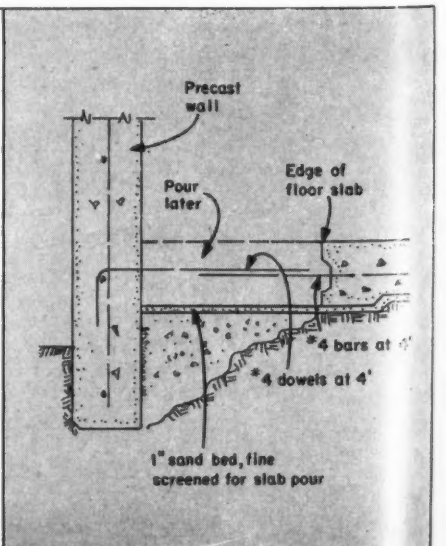
JOINING WALL TO CAST IN PLACE ROOF



STEEL WINDOW SASH CAST IN PANEL



STEEL DOORS CAST IN TILT-UP PANEL



A WALL TO FLOOR JOINERY DETAIL

height and weight of panels used in tilt-up work continued to increase, the stresses induced by lifting also increased, and it became necessary to adopt measures to protect the panels from overstressing and cracking. A common protective measure was the use of strongbacks, which aided in load distribution and reduced the probability of harmful stress concentration. Lifting with strongback attachment was particularly useful in handling panels with large openings or other irregularities, but strongbacks may themselves deflect, and they do not furnish a complete answer to the problem.

Pickup Layouts

Vacuum mat equipment properly installed in a lifting frame furnishes an excellent erection method for tilt-up panels. Vacuum lifting minimizes panel stresses, and irregular shapes and panels with openings can be handled with minimum danger of damage. However, the vacuum method is not always available or economical and the lifting of panels by the provision of pickup points, carefully positioned and anchored in the concrete, is by far the most common current practice. Correct selection of number and position of pickup points for panels of varying dimensions and weight is of critical importance. The layout should be selected so as to balance moments in the lifting operation and limit the stresses produced in the panels to values for which provision can be made in the design.

Theory indicates that critical stresses occur in lifting as the panel rotates on its lower edge and reaches a slope of about 30 degrees from the horizontal. This assumption permits the determination of stresses with considerable accuracy, and the engineer can include reinforcement in bands of the panel or provide flexural strength of concrete in the panel to resist the erection stresses.

Depending on the size and weight of panels, pickup points may be placed in a single row parallel to the top edge or in two (even three) rows across the panel. Assume a light panel which will be picked up by means of two lift points. In accepted practice, these points would be located at 0.205 times the width from either side of the panel, and 0.2 times the height below the top edge. Now, assume a heavier panel to be picked up at four points. The upper pair would be located as described for the preceding example, the second pair would be at the same distance from the panel sides and at 0.45 times the height below the first pair. These layouts are typical of solid panels or those without openings requiring a special consideration. They illustrate conditions of rather general application. Six point pickup was used on a Southern California building having panels about 20-ft wide and 34-ft high and weighing 30 to 35 tons. Two, 35-ton cranes lifted on either end of a heavy equalizer from which was swiveled a spreader bar. Each end of the spreader was connected to the three points along one side of the panel by a cable of designated length. This cable was tied at the spreader bar, passed alternately through skookum blocks at panel and spreader, and brought to a final tie at the spreader. The cable length was determined to provide uniform lifting on the three points. A drawing shows a typical layout for this 3-pair, 6-point pickup, as designed by J. L. Peterson, Structural Engineer.

Erection Stresses

While it is theoretically possible to design the concrete panels so as to have sufficient flexural strength at the age of lifting to resist erection stresses and to control panel cracking, it is a rather common practice (required in some regulatory jurisdictions) to introduce reinforcement in such manner as to provide beam action to resist lifting stresses without stressing the steel beyond its yield point. The resisting beams are considered to be sections from top to bottom of the panel, centered on the pickup points, with beam width of eight times the thickness for single pickup points, or eight times thickness plus 12 inches for double pickup points. The requirements are readily satisfied by placing additional reinforcing bars in the panel sections at these beam locations.

Tilt-Up Joinery

The details of joinery between tilt-up panels, and the connections at roof and floor, have developed through experience to the extent that some details may be called standard practice. A few of the joinery methods most commonly and successfully used and several other details are shown on page 82.

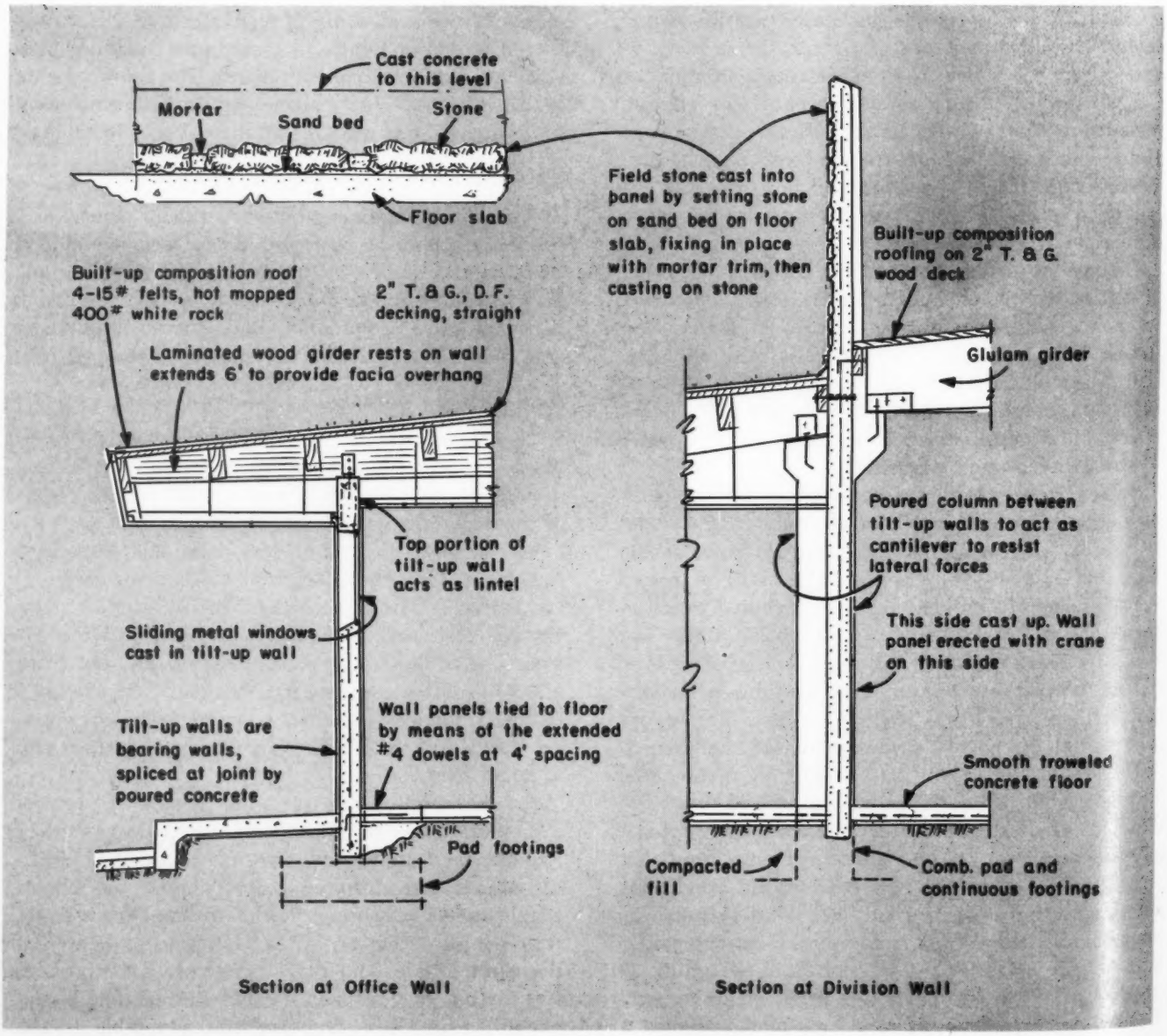
Typical Tilt-Up Buildings

Two buildings are illustrated (pages 84 & 85) to show the use of tilt-up construction and a few distinctive features in industrial structures. Both of these designs were by F. Thomas Collins.

The general view of the International Furniture factory, at Corona, California, shows some interesting features. The cross-section drawings show how the tilt-up panels were fitted into the building design. The center of the picture shows the decorative effect of casting concrete panels over a prepared bed in such a manner as to transfer the special facing to the surface of the precast panel in true pattern and at small expense.

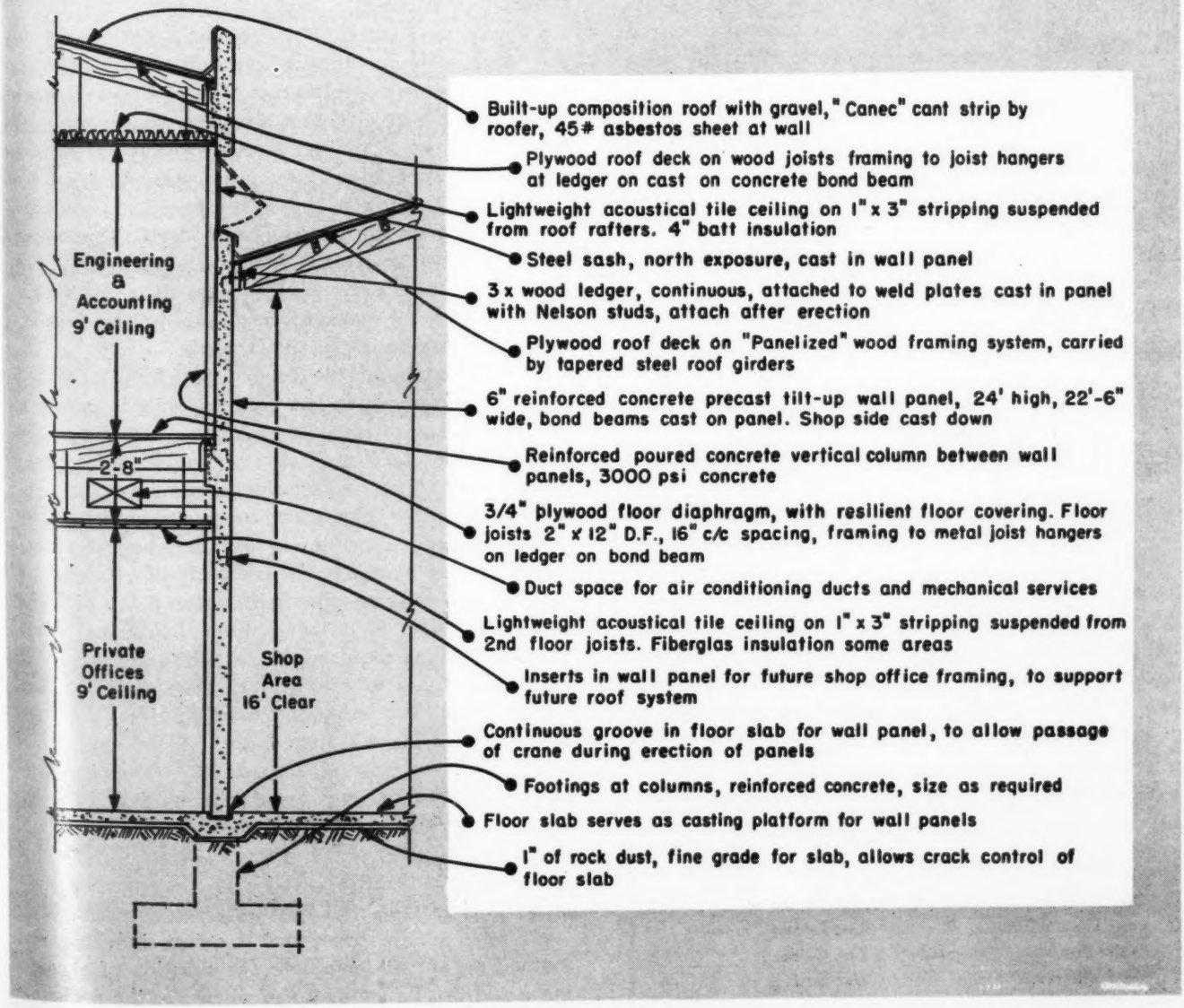
Another photograph presents a general view of a shop and office building for Air Products Co., Los Angeles, and shows effective use of two-story, tilt-up panels. The drawing accompanying the photograph shows a section at the dividing cross-wall, which is an extension of the wall at right-center of the photograph. The drawing gives a comprehensive listing of construction and design details applicable to such a structure and adaptable to the tilt-up method. ▲▲

TILT-UP CONSTRUCTION WAS USED IN DESIGN OF PLANT FOR INTERNATIONAL FURNITURE CO., IN CORONA, CALIF.


Cast concrete to this level
Mortar
Sand bed
Stone
Floor slab
Built-up composition roof 4-15# felts, hot mopped 400# white rock
2" T. & G., D.F. decking, straight
Laminated wood girder rests on wall extends 6' to provide facia overhang
Top portion of tilt-up wall acts as lintel
Sliding metal windows cast in tilt-up wall
Tilt-up walls are bearing walls, spliced at joint by poured concrete
Wall panels tied to floor by means of the extended #4 dowels at 4' spacing
Pad footings
Section at Office Wall
Field stone cast into panel by setting stone on sand bed on floor slab, fixing in place with mortar trim, then casting on stone
Built-up composition roofing on 2" T. & G. wood deck
Glulam girder
Poured column between tilt-up walls to act as cantilever to resist lateral forces
This side cast up. Wall panel erected with crane on this side
Smooth troweled concrete floor
Compacted fill
Comb. pad and continuous footings
Section at Division Wall

ELEVATION CROSS SECTIONS AND DETAILS SHOW HOW TILT-UP PANELS FIT INTO OVER-ALL BUILDING DESIGN.

SHOP AND OFFICE BUILDING FOR AIR PRODUCTS CO., LOS ANGELES, SHOWS HOW TILT-UP FITS TWO-STORY DESIGN.


Engineering & Accounting 9' Ceiling
2'-8"
Private Offices 9' Ceiling
Shop Area 16' Clear
Built-up composition roof with gravel, "Canec" cant strip by roofer, 45# asbestos sheet at wall
Plywood roof deck on wood joists framing to joist hangers at ledger on cast on concrete bond beam
Lightweight acoustical tile ceiling on 1" x 3" stripping suspended from roof rafters. 4" batt insulation
Steel sash, north exposure, cast in wall panel
3 x wood ledger, continuous, attached to weld plates cast in panel with Nelson studs, attach after erection
Plywood roof deck on "Panelized" wood framing system, carried by tapered steel roof girders
6" reinforced concrete precast tilt-up wall panel, 24' high, 22'-6" wide, bond beams cast on panel. Shop side cast down
Reinforced poured concrete vertical column between wall panels, 3000 psi concrete
3/4" plywood floor diaphragm, with resilient floor covering. Floor joists 2" x 12" D.F., 16" c/c spacing, framing to metal joist hangers on ledger on bond beam
Duct space for air conditioning ducts and mechanical services
Lightweight acoustical tile ceiling on 1" x 3" stripping suspended from 2nd floor joists. Fiberglas insulation some areas
Inserts in wall panel for future shop office framing, to support future roof system
Continuous groove in floor slab for wall panel, to allow passage of crane during erection of panels
Footings at columns, reinforced concrete, size as required
Floor slab serves as casting platform for wall panels
1" of rock dust, fine grade for slab, allows crack control of floor slab

TWO-STORY DESIGN WAS USED FOR OFFICE WHILE SHOP AREA HAS HIGH CEILING. TILT-UP PANELS SERVE BOTH.

ALLEN L. ALEXANDER, Head, Protective Coatings Branch
Chemistry Division, U. S. Naval Research Laboratory

Allen L. Alexander received his PhD from the University of North Carolina in 1936. He went to work as a research chemist with the Sherwin-Williams Company, changing after two years to become research chemist with the Naval Research Laboratory. He is now head of that laboratory's Protective Coatings Branch and associate superintendent of the Chemistry Division. He has held many offices with the Chemical Society of Washington and the National Association of Corrosion Engineers. He is a member of the American Society for Testing Materials and is chairman of a committee studying supplementary treatments for electrodeposited zinc. He is also a member of the Federation of Paint and Varnish Production Clubs, The American Institute of Chemists, the Washington Academy of Sciences, and the Research Society of America. He has served as a guest lecturer at both the University of California and the University of Tennessee.

How to Specify Organic Coatings

THE USE OF ORGANIC COATINGS to protect metal predates most other protective techniques by several hundred years. Lacquers formed by the solution of naturally occurring resins in spirits or other available solvents have been found on objects from the earliest known cultures. But only during recent years has the knowledge of organic coatings changed from an art to a science. With this transition the specifying of the optimum coating for a given application has become a true engineering task as important to a project as the specifying of materials of construction.

Special Purpose Coatings

Undoubtedly organic coatings designed to stop or slow the rate of degradation of metals comprise by far the largest volume of functional (as opposed to decorative) organic coatings consumed. However, designers and specifications writers also should know about fire retardant paints for wood structures, impermeable and chemically resistant coatings for lining concrete or steel fuel storage vaults, fluorescent paints for marking danger spots in traffic, antifouling paints and antimildew paints for protection against attack by living organisms, antifriction coatings, and even temperature-indicating paints which show the maximum temperature reached by a simple change in color.

Chemically resistant coatings have made possible the large scale handling of corrosive chemicals directly in tank cars, which was unthinkable a quarter of a century ago. There also are those coatings whose function is complementary to other protective techniques, such as cathodic protection. As a matter of fact, only through the development of coatings compatible with this process has it become economically feasible to realize the advantages available from the use of impressed current to counter corrosive attack on susceptible metals in those environments conductive to the process.

In recognition of the crucial role now assumed by organic coatings in the design of highly complex instruments of warfare, it is not uncommon for the amount of research and development going into final production of an acceptable organic coating to equal or exceed that given to some of the other design components of more functional or dynamic nature. As an example, the research effort spent for an efficient enamel-type antifouling paint of light weight for use on hulls of flying boats was comparable to that required for adapting conventional hydraulic fluids to the peculiar needs of aircraft. Undoubtedly the engineer who specifies coatings now shares a large responsibility for the useful life and utility of most structures or mechanisms to which his designs may be applied. It follows logically, therefore, that his recommendations, when based on sound experience and research, should be followed as carefully as those of the engineer specifying other materials or equipment.

So long as the protective coatings industry remained an art the complete specification of a coating could not be critical. For example, the designation "red lead primer" carried the implication of

TABLE 1—INHIBITIVE PIGMENTS

Lead	*Zinc*
Red Lead	Zinc Chromate
Basic Lead Sulfate	Zinc Tetroxy Chromate
White Basic Lead Carbonate	Zinc Oxide
Lead Chromate	Zinc Dust

nothing more than a dispersion of the red oxide of lead pigment in linseed oil, properly treated with adequate driers. In present practice, however, such a designation would be hopelessly inadequate, since there is available almost an infinite number of resinous vehicles in which the red lead might be dispersed to form highly efficient anticorrosive coatings. Some might be wholly unsuited for the application at hand. Just as the designer of any major structure has at his disposal a variety of materials from which he may select those most readily adaptable to stated requirements. so the engineer specifying coatings has available a wide selection of resinous materiels and, to a more limited degree, a variety of inhibitive pigments from which he may select the most efficient combinations tailored to the exact requirements of any set of conditions.

Corrosion Inhibitive Coatings

It is generally agreed that in order for corrosion of metals to proceed, it is only necessary for moisture and oxygen to come in surface contact with the susceptible metal. Thus, the obvious cure would be to apply some coating to the metal to make it completely impermeable to both air and moisture. Unfortunately, no organic coatings have yet been designed that are capable of meeting these conditions completely, and therefore it is necessary to combine organic films, intended to allay corrosion, with pigments whose chemical nature is such as to passivate the metal or render it less susceptible to attack by moisture and oxygen when they do reach the coated metal surface, as inevitably they must.

In Table 1 are listed the most commonly used pigments employed in anticorrosive coatings as primers. They consist principally of oxides or salts of lead and zinc. A few additional pigments, mainly iron oxide and the chromates of calcium and strontium have demonstrated some protective value but only in highly specialized applications.

Red lead is available in several grades which vary in Pb_3O_4 content between 85 and 98 percent. The remainder is litharge, PbO. Red lead probably has been the most widely used anticorrosive pigment for the protection of iron and steel through the years, even before any speculation as to its functional mechanisms had been undertaken. Today its inhibitive qualities usually are attributed to its alkaline and oxidizing nature when in contact with iron and steel in the presence of moisture. In addition, it reacts with vegetable oils to form soaps, most of which are relatively insoluble. These soaps become reinforcing agents of the film, increasing its moisture resistance and contributing to increased film strength.

In the design of primers based on red lead or other inhibitive pigments, it is possible to vary the ratio of drying oil to resin to obtain films with a wide variety of physical properties such as imperviousness to moisture, flexibility, hardness, and the ability to control the oxidizing effect of the pigment. Furthermore, red lead is considered a good passivator for iron through, probably, the formation of the ion PbO^{--}, which may form a complex with iron at the surface.

Referring to the lead pigments of Table 1, basic lead sulfate is available in two forms:

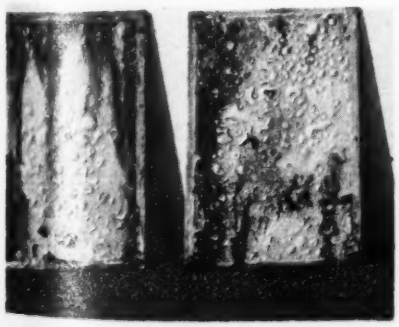
White — $2PbSO_4 \cdot PbO$

Blue — contains, in addition, PbS and PbO

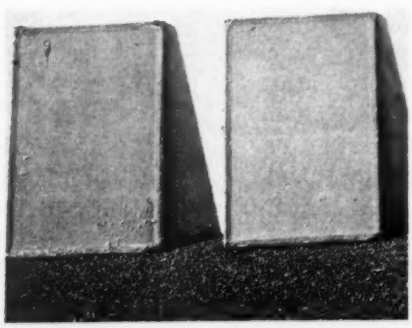
While the use of basic lead sulfate does not compare in range of application with red lead as an inhibitive pigment, it has been found to perform favorably in primers for underwater steel. Being of a strongly basic nature, primers based on basic lead sulfate also offer an advantage for service in acidic areas.

White basic lead carbonate, while included in Table 1, is used principally as a hiding pigment in topcoats. Experimentally, however, its use in inhibitive primers is being considered carefully.

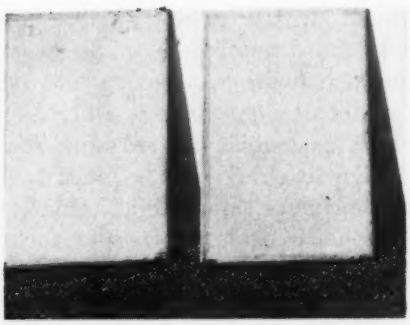
Classed somewhere between the lead pigments and those based on the chromate ion, lead chromate has proven quite useful in certain applications. This pigment is not so reactive with some vehicles and therefore may be used where corrosive conditions are not quite so severe as to demand the use of red lead. Being less soluble than the more commonly



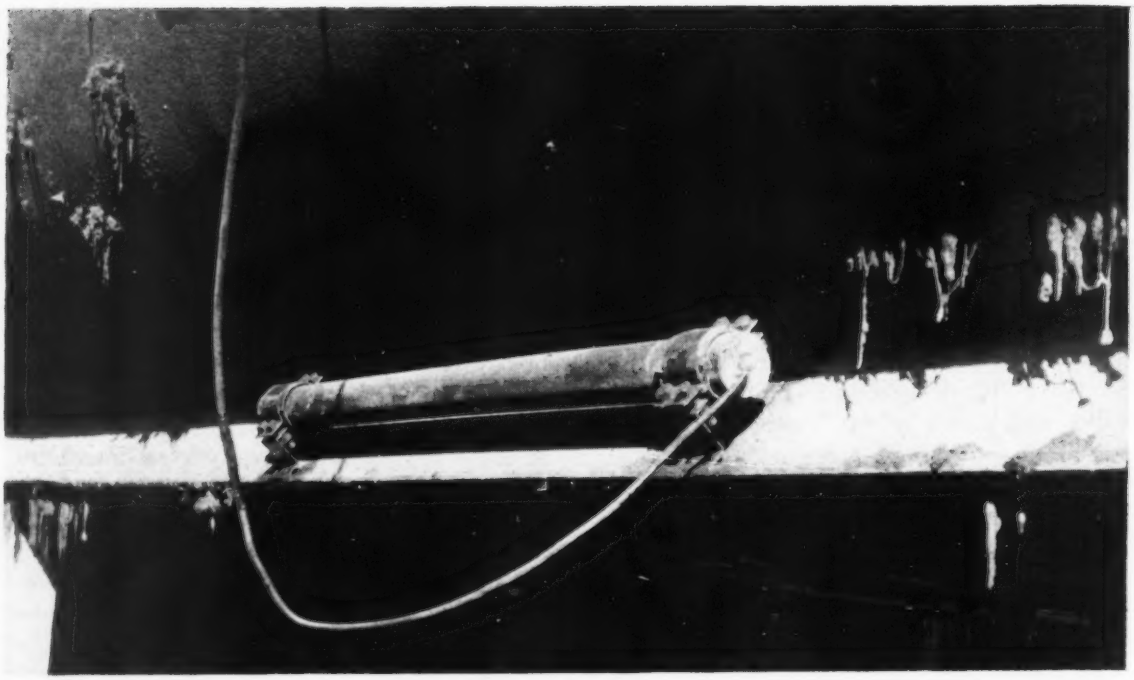
SANDBLASTED STEEL FINISHED WITH PHENOLIC ZINC CHROMATE PRIMER AND ALKYD TOPCOATS, EXPOSED TO SEA WATER SPRAY FOR SIX MONTHS.



THESE PANELS ARE OF SAME TYPE AS THOSE AT LEFT AND WERE TREATED IN SAME MANNER EXCEPT FOR PRELIMINARY COAT OF WASH PRIMER.



THESE PANELS WERE COVERED WITH WASH PRIMER, VINYL ZINC CHROMATE PRIMER, AND VINYL-ALKYD TOPCOAT, AND THEN EXPOSED WITH OTHERS.



CLOSE-UP OF CARBON ANODE USED TO SUPPLY CATHODIC PROTECTION TO A SHIP'S HULL.

used chromate pigments, lead chromate may be used in vehicles that are less impervious to moisture than would be compatible with zinc chromate.

No single pigment has caused a greater revolution in the design of anticorrosive primers than the so-called zinc chromate, or zinc yellow. It possesses a versatility that is lacking in lead pigments. Most standard protective systems for the alloys of aluminum and magnesium require the application of a zinc yellow primer regardless of the service to which they are to be put. Similarly, zinc yellow primers have found wide application in the protection of steel and at one point supplanted the use of red lead in specifications for the protection of ships of the U.S. Navy. Recent work has indicated that multiple pigment primers taking advantage of the better points of both zinc chromate and red lead can be formulated for use over steel. Zinc yellow remains, however, the overwhelming choice for the lighter metals and their alloys.

The introduction, in 1942, of a new pigment known initially as zinc tetroxy chromate made possible the development of the wash primers, which now are finding extensive and unique application. Zinc tetroxy chromate is a highly insoluble pigment which resembles the residue remaining after extensive leaching of zinc yellow. When formulated into primers containing a blend of alcohols and phosphoric acid, it provides for unusual adhesion to many surfaces heretofore considered hard to coat.

Zinc oxide probably should not be considered primarily as an inhibitive pigment, but it is used widely and to good effect in many acidic areas where a ready acid acceptor is desirable. As a good example, a number of important uses have been found where extreme chemical resistance is required for films made of chlorinated rubber. The antifouling composition designed particularly for the hulls of flying boats makes use of mercurous chloride as the toxic ingredient dispersed in a film of chlorinated rubber. Chlorinated rubber in some circumstances is subject to very slight decomposition with the liberation of free HCl. Furthermore, if mercurous chloride should display any tendency to oxidize or be reduced with the liberation of free chlorine, zinc oxide is a convenient acceptor for these liberated products, which otherwise would prove rather corrosive. Formulations containing liberal amounts of zinc oxide have given good service over aluminum with no accelerated corrosion attributable to degradation products in the film.

Finely divided zinc dust is used extensively in metal paints for the protection of potable water tanks or for fresh water submersion. Primers employing zinc dust have found considerable application with galvanized steel. However, the wash primer types probably will supplant them for this particular use.

Resin Type Pigments

There are also pigments of the resin types which are available for use alone or in the form of modifications with each other and with a variety of vegetable oils for formulation of corrosion inhibitive coatings for metal application. Among the more important are the phenolformaldehydes (pure or modified), alkyds (glycerol phthalate and modified types), coumarone indene, urea and melamine formaldehyde, silicones, maleic, vinyls, rubbers (both synthetic and natural), acrylonitriles, nitrocellulose, the

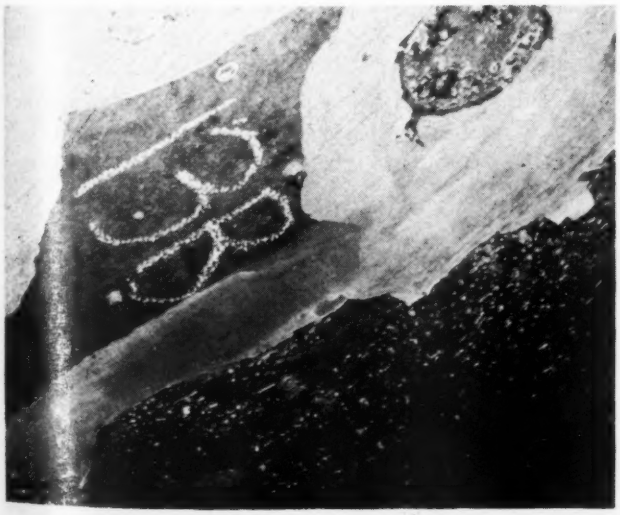
asphaltums, and more recently, the epoxies and polyurethanes. It must be realized that in each of the groups a variety and, in some instances, an almost infinite number of combinations are possible from which exact properties can be developed for any application.

Surface Preparation

The inherent integrity of a paint system of highest quality may be destroyed completely by improper application or inadequate surface preparation of the material to which it is applied. For metals exposed to corrosive environments, surface preparation assumes added significance, for once corrosion gets a start between the metal and the paint, the entire paint film may be destroyed and corrosion then will proceed unchecked.

Surface preparation perhaps reaches the ultimate as presently practiced in the treatment of automobile bodies and many household appliances prior to painting. The metal is cleaned in chemical baths with the subsequent formation of conversion coatings on the surface, as typified by the "Parkerizing" or "Bonderizing" processes. These coatings, themselves, possess inherent corrosion resistant qualities, but even more important, they provide a most favorable base to receive subsequent coats of organic coatings especially designed to combat corrosive influences. Without this substantial base, the life and effectiveness of the organic materials would be curtailed substantially.

Unfortunately, few, if any structures, are amenable to this type of treatment, and therefore it is important that the consulting engineer appreciate thoroughly the real value to be derived from an adequately prepared metal surface prior to painting. The best protection is obtained by combining optimum surface preparation with the application of a high quality organic protective coating system.



EXCESSIVE OR POORLY DISTRIBUTED CURRENT FOR CATHODIC PROTECTION RESULTS IN PAINT FAILURE.

If factors prevail that limit the extent of surface preparation, the highest quality coatings (somewhat paradoxically) do not necessarily provide protection equivalent to that obtainable from much cheaper formulations with radically different properties. For example, it would be unwise to paint a badly rusted steel surface with a high quality vinyl or phenolic enamel, as such coatings possess only average wetting properties with poor penetration, and they would attach only to the rust and obtain no real anchor to the unoxidized metal beneath. No barrier of consequence is formed between the corroding metal and the moisture and oxygen of the air. As corrosion proceeds the film is gradually loosened and eventually comes off carrying with it some particles of rust.

Treating Rusty Surfaces

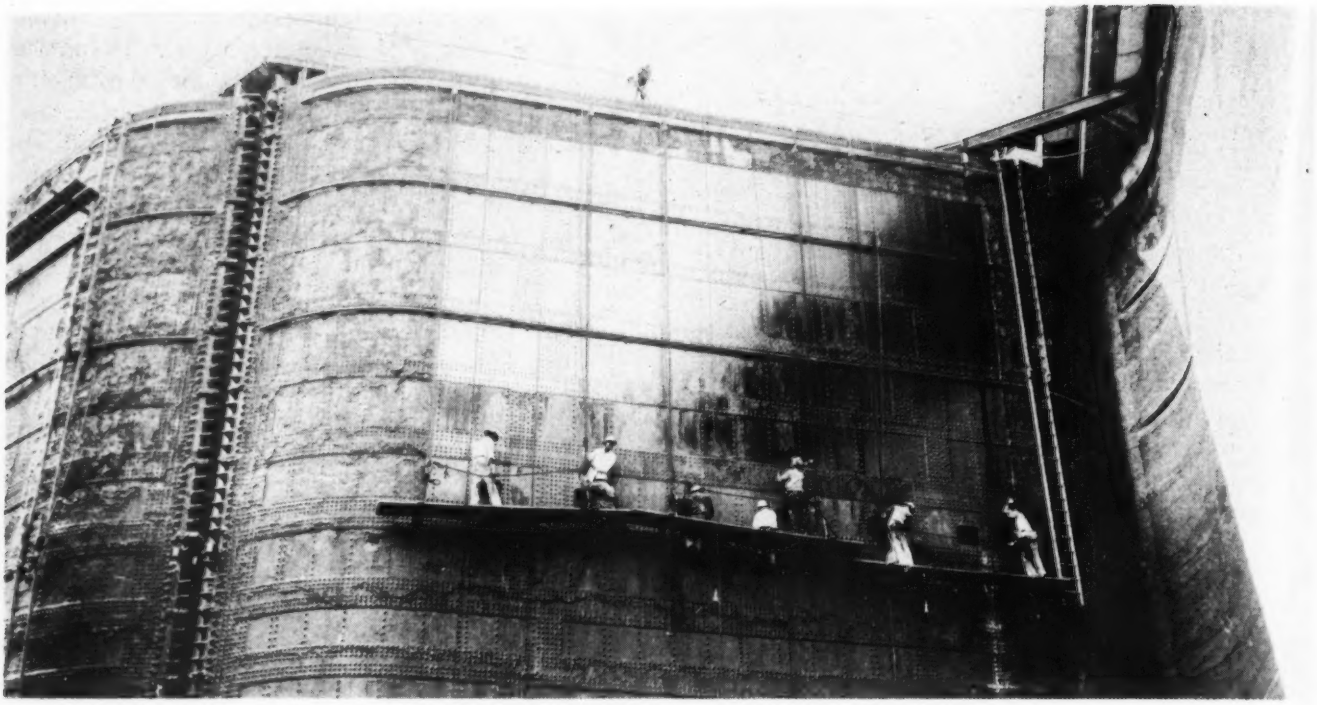
On the other hand, some degree of inhibition can be provided to a rusty surface by applying one or two coats of a long oil varnish or a thin, highly wetting rust inhibitive compound with the ability to wet thoroughly the rust particles and readily absorb into the most minute interstices of the surface. Solutions of linseed or fish oils in suitable solvents are typical of such preparations. By use of these materials at least a partial or temporary exclusion of moisture and air from the actively corroding surface results with an accompanying retardation in corrosion rate. Although this poorer quality coating is highly preferable for use over a rusted surface, the protection obtained cannot be compared to that to be expected from a quality enamel applied to the same metal surface, properly cleaned.

During the past 10 years the value of surface preparation has been demonstrated repeatedly both from the standpoint of economics and improved, uninterrupted service. Therefore it follows that surface preparation of a metal is largely responsible for the ultimate protection afforded by the coatings. It is generally accepted that paint is held on the surface by its molecular attraction to the metal and by mechanical anchor which exists between the paint film and the surface of the metal. The nature of the molecular anchor may be affected by the contamination of the metal surface, as exemplified by the presence of grease and oil, and by factors that are inherent to the coating. Thus, the exact specification for a properly formulated coating for each particular job becomes important.

Specific End Conditions

The nature of the mechanical anchor can be controlled somewhat by mechanical means such as sandblasting. Depending on the service, three different end conditions can be produced when mill scale is removed from new steel by sandblasting.

White Steel Surface Finish. This condition implies the complete removal of all corrosion products



THE PANAMA CANAL LOCKS, HERE BEING CLEANED AND REPAINTED, GOT FIRST CATHODIC PROTECTION IN 1940.

— all mill scale and dark grey mill scale binder — exposing white metal for good paint connection.

Commercial Surface Finish. This includes the complete removal of all corrosion products along with all tight and loose mill scale. It does not include the removal of dark grey binder. A commercial blasting job looks rather streaky, but it does produce an excellent surface anchor for paint.

Brush-off Surface Finish. This finish provides for the complete removal of all corrosion products along with all the loose mill scale. It does not imply the complete removal of all tightly adhering mill scale. However, the blast material does produce on the tight mill scale an anchor pattern which is quite acceptable as a paint base in many instances.

Cost Considerations

The choice of the most appropriate surface finish will be dictated by balancing surface preparation costs against service requirements. For example, differences in cost may be relatively small for preparing the interior of a fuel storage tank where extensive scaffolding must be rigged to get at the job. The return in service between paint jobs would compensate many time for the extra cost of the optimum surface. On the other hand, the owner of a merchant vessel may not feel that the highest quality hull finish is justified since his ship must be drydocked at least once a year for inspection, at which time the hull normally is refinished.

Where chemical treatments are feasible in addition to proper cleaning of metallic surfaces, the service life of the metal so protected approaches the ultimate. Phosphate coatings on steel applied prior to painting generally are recognized as increasing corrosion resistance by providing a good bond between metal and paint, by inhibiting the spread of rust around breaks in the film, and by minimizing blistering sometimes associated with cathodic areas. Similarly, the formation of anodic films of oxide on aluminum and its alloys, followed by efficient organic coatings, provides considerably increased protection from corrosion, particularly from salt water and salt laden atmospheres. Other treatments, such as chromic acid wash, are less expensive and provide protection commensurate with their cost. Some measure of protection also can be imparted to magnesium alloys by first giving them a chrome-pickle treatment which encourages greatly improved adhesion of inhibitive primers and topcoats.

Among the more recent and spectacular treatments applicable to a variety of metal surfaces has been the development of the so-called wash primer previously mentioned. While this material originally was designated as a primer, it has become accepted as a metal treatment and should be used with organic inhibitive primers. The formulation of the wash primer was made possible with the development of the highly insoluble basic zinc yellow pigment known originally as zinc tetroxy chromate. This pigment is dispersed in a solution of polyvinyl butyral resin and for application is thinned to a water-like consistency with a mixture of 85 percent phosphoric acid and alcohols. It is applied directly to the metal either by brush or spray to a film thickness of only 0.2 mils, which further proves it to be merely a treatment rather than a primer. The wash primer may be followed by the applica-

tion of more orthodox primers and finish coats. Perhaps the most dramatic performance obtained through the use of this product is the excellent adhesion made possible to metallic surfaces heretofore considered most difficult to paint. Typical of such surfaces are galvanized steel, cadmium plate, electrodeposited zinc, and stainless steel.

Wash Primer Tests

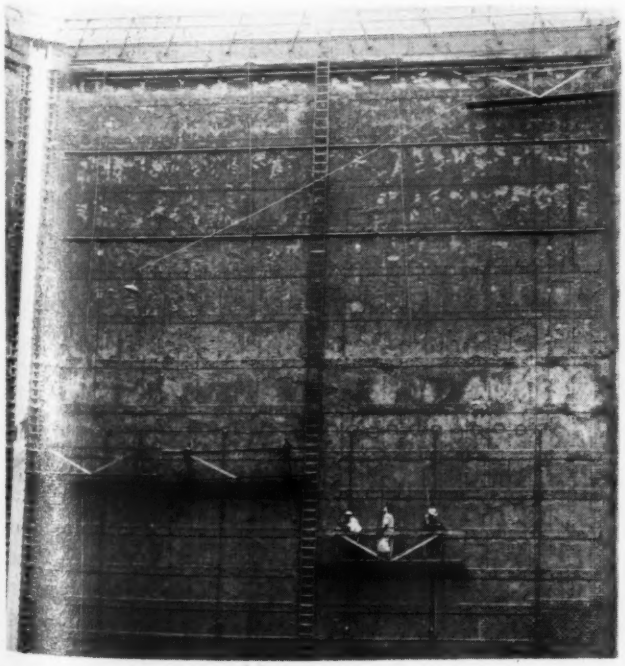
The tremendous impact of wash primer on the painting of steel structures in marine atmospheres is illustrated by some simple experiments which in themselves could not be accepted as conclusive, but subsequent experience has proven the experiments quite representative. The panels shown in the accompanying photographs are sandblasted steel finished with two coats of zinc chromate primer in a phenolic vehicle, followed by two coats of an alkyd enamel typical of those specified for general outdoor service on steel. The coated panels were placed in a salt spray box in which filtered sea water is the spray. The condition shown is that which existed following six months' continuous exposure to the sea water spray — a rather severe test for paint films applied to steel. A similar set of panels was prepared and exposed to the same set of conditions, except the first coat of zinc chromate primer was preceded by a thin coat of wash primer. The result of this test is also shown.

Another important facet of the wash primer development is its ability to adapt vinyl primers to a much wider application. Earlier all-vinyl systems were not satisfactory in view of the generally poor adhesion of vinyl primers when applied directly to steel. Now predominantly vinyl systems are available that exhibit considerable improvement. To illustrate, panels were prepared using wash primer, a vinyl-zinc chromate primer, and a vinyl-alkyd topcoat. These were exposed to the sea water spray simultaneously with the panels already described. The result is shown. This latter system has now replaced the earlier combination in a number of applications.

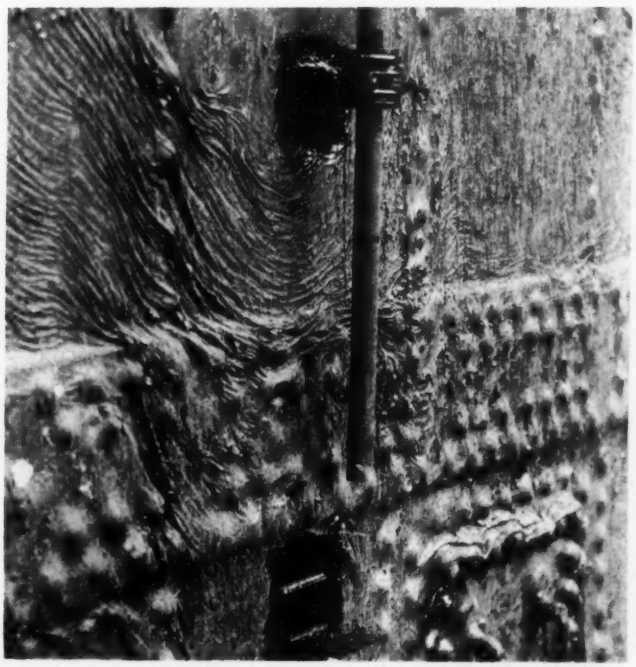
Coatings Plus Cathodic Protection

Although cathodic protection was gaining wide acceptance as a reliable method for protecting underwater metal surfaces from corrosion, the dramatic appearance of wash primer and the subsequent rapid development of all-vinyl coating systems stimulated a large scale adaptation of this technique. When steel is exposed to an electrolyte, as is steel piling supporting a waterfront structure or a pipeline buried in moist earth, corrosion will occur unless the metal is protected. Corrosion is accompanied by a flow of direct current from the metal. This may be stopped, or the rate drastically reduced, by insulating the steel with a continuous coating of a water-resistant material such as a hot applied coal tar enamel or by impressing a stronger flow of current in the opposite direction. The best coal tar enamels are subject to cracking and chipping, thus providing noninsulated areas which corrode at an accelerated rate.

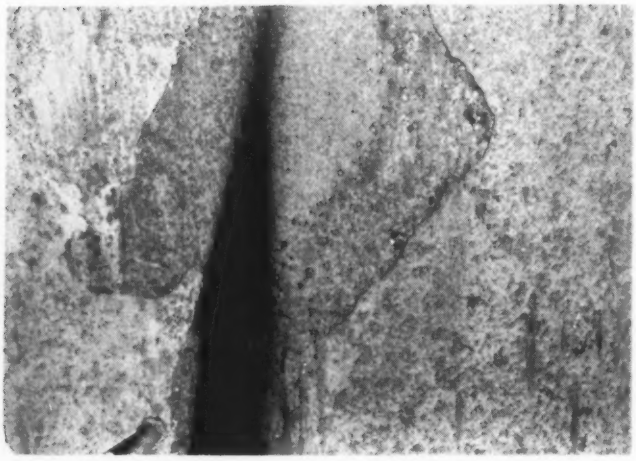
A combination of cathodic protection and a properly designed organic coating system complement each other rather handily. Without the coating, current requirements on jobs involving considerable



HERE WORKMEN ARE INSTALLING ANODES TO LOWER HALF OF THE GATES TO THE LOCKS OF THE CANAL.



CLOSE-UP OF INSULATOR FOR ANODE USED TO SUPPLY PROTECTION TO LOCK GATE OF PANAMA CANAL.



SCALY CORROSION AS FOUND IN GASOLINE TANKS.

SECTION OF GASOLINE CARGO TANK COATED WITH VINYL TYPE FINISH AFTER 19 MONTHS SERVICE.

area are of such magnitude as to be economically unsound. On the other hand, if the coating is damaged or fails for any reason, the current takes over to prevent corrosion. Currents necessary to protect a ship's hull, for example, range from 0.1 milliampere per square foot for a freshly painted hull to 3 milliamperes per square foot for an average hull in need of normal maintenance painting. This compares with 10 milliamperes per square foot required to protect bare steel. For this reason vinyl finishes are now widely specified for ships' hulls to which cathodic protection is added.

For a great many years coal tar enamels have been widely used for the protection of steel surfaces exposed to water. These enamels are highly impervious to water, and this coupled with their alkali resistance makes them especially appropriate for use with cathodic protection systems where thick films can be tolerated. High electrical resistance, low permeability, and good alkali resistance are generally accepted criteria in the specification of coatings best able to withstand the effects of cathodic protection currents. Vinyl films also qualify and ordinarily do not require the use of relatively thick films characteristic of coal tar enamel.

Current Requirements

Where current requirements are quite small, they may be supplied by coupling a sacrificial anode to the metal to be protected. Magnesium, zinc, and sometimes aluminum are used for this purpose. The size and surface areas of such anodes are dictated by current requirements for the protected areas. For major installations, however, direct current is supplied from rectifier units to steel or carbon anodes mounted near the areas needing protection. Size and location are determined by current distribution requirements. When current is applied to the system, an electrochemical reaction occurs at the protected surface-water interface where gaseous hydrogen is evolved accompanied by a concentration of hydroxyl ions. This produces a highly alkaline reaction at the surface.

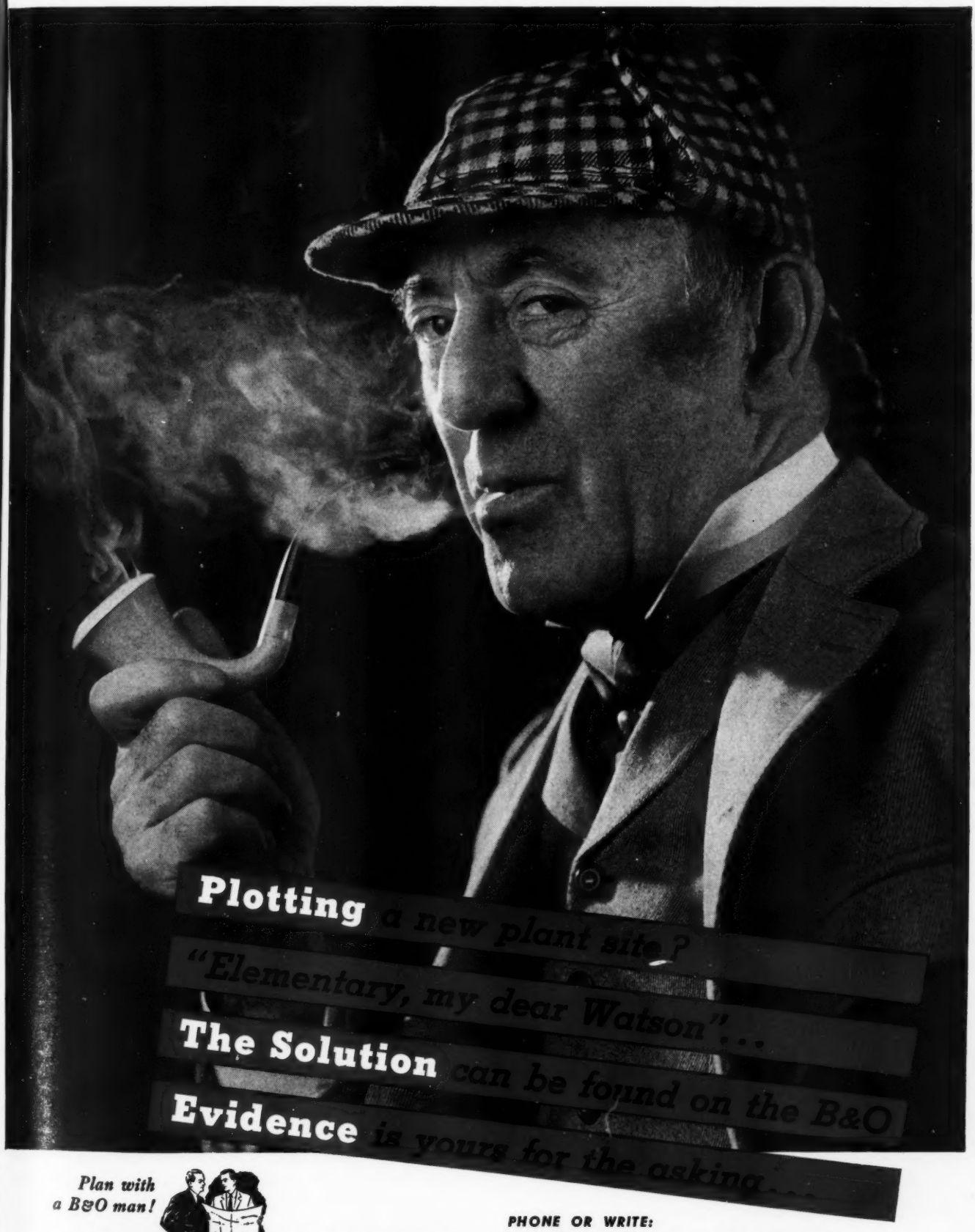
Oleoresinous and oil paints as well as many alkyds show little resistance under these conditions and fail rapidly. This is true regardless of pigmentation, and it makes little difference whether the primer is pigmented with red lead or zinc chromate. Vinyl and coal tar enamels are relatively unaffected by these conditions and therefore are strongly recommended. When it is possible to obtain excellent surface preparation, the thinner films of vinyl enamel usually are adequate. If good surface preparation is lacking, the thicker coal tar films are best.

An experimental installation of a graphite anode for supplying current to a ship's hull is shown. Unfortunately, this anode was placed too close to the painted metal, and this, together with an excessive current density, destroyed great areas of paint. Even the most resistant coatings will fail and will be destroyed if current density and distribution are not controlled.

Panama Canal Gates

The lock gates of the Panama Canal were among the first installations to which cathodic protection of the impressed current variety was applied. A photograph shows workmen in the process of applying hot coal tar enamel to a gate. The first coat consisted of a coal tar primer applied from solution by hand brushing. The enamel is solid at ordinary temperatures and was heated to 400 F and applied with Tampico fibre brushes to a minimum thickness of 1/16-in.

The first cathodic protection was applied about 1940, and at present all the gates at the two lower levels of locks are protected. Since the three-stage locks are fed from the top with fresh water, the alkalinity, and thus the conductivity, of the water



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in the upper chambers is so low as to make cathodic protection impractical.

Another photograph shows anodes being installed over a freshly enameled gate. An electrical conductor leading to the anodes is apparent at each side near the top. Only the bottom half of this gate comes in contact with salt water, therefore the anodes are installed only along the lower half. A close view of the anode installation is also shown. The anode is insulated electrically from the metal of the gate by a nonconducting (Bakelite) insert in the clamp. The only flow of current from the anode to the surface of the metal therefore must be through the water. The sags apparent in the enamel occurred as the supporting bracket was being welded to the base metal of the gate.

Immediately following overhaul electric current requirements are quite small, since little or no bare metal is exposed. As breaks or cracks occur in the coating, current flows from the anodes to the bare spots reducing corrosion damage. Somewhat conversely, the amount of current required under a given potential and proper distribution can serve as an index of the condition of the coating. Since installation of cathodic protection to the Panama Canal lock gates, the time between overhaul periods has approximately doubled.

With coal tar coatings the exclusion of moisture from the metal surface is due to the thickness and impervious nature of the film. Therefore, the incorporation of inhibitive pigment films does not offer any considerable advantage. Proper pigmentation is important, however, in vinyl formulas where much thinner films are involved.

Perhaps the most extensive applications of cathodic protection are those on pipelines used for the transmission of oil and gas. Depending on soil or moisture conditions, and thus the quantity of current required, either sacrificial anodes or impressed current may be used. Either way the necessity for an impervious alkali and electrically resistant coating remains. In pipeline construction the coating frequently is reinforced with either glass or asbestos felt or fabric which is sandwiched between applications of coal tar enamel. Following the application of the final coat, a careful check is made with an electronic holiday detector to discover any bare spots which might leak current and thus permit corrosion. Without the insulating qualities of the coating, cathodic protection of pipelines would be prohibitively expensive.

Other Coating Applications

Almost traditionally the interior surfaces of steel fuel storage tanks as well as the cargo compartments of fleet tankers have received no organic coating protection. This has been the result of several factors, among which was the lack of resinous film-forming materials capable of withstanding the solvent action of the fuels. During the last several years, however, the utility of organic coatings to reduce corrosion in areas of this nature has been strikingly demonstrated. Application has been made possible by the development of new resinous types which are insoluble in all components of fuels of petroleum origin. Corrosion rate for the most part has been considered tolerable and accompanied by no apparently serious fuel contamination.

On tankers corrosion may be quite severe, since sea water ballast frequently is taken aboard. A typically corroded bulkhead in a tanker is shown. There is also a view of a cargo tank painted with a typical vinyl coating. This shows the condition after 19 months' service in which sea water was carried as ballast between fuel cargos.

For the exteriors of fuel storage and handling systems, a number of serviceable materials are available. Recently the epoxies have found increased use, as they have demonstrated a resistance to fuels and good durability. The vinyls continue to offer excellent protection for petroleum handling equipment, and they possess the resistance to withstand degradation by inadvertent spillage.

In instances where a dry lubricant is required in addition to some protection from corrosive environments, thin films of polytetrafluoroethylene resin, or Teflon, offer a happy solution. While many of the applications of this material have been to military equipment, it does hold promise in many other areas. Quite recently the individual strands of wire in aircraft control cable have been coated successfully. This not only tends to allay corrosion but simultaneously reduces wear and fraying.

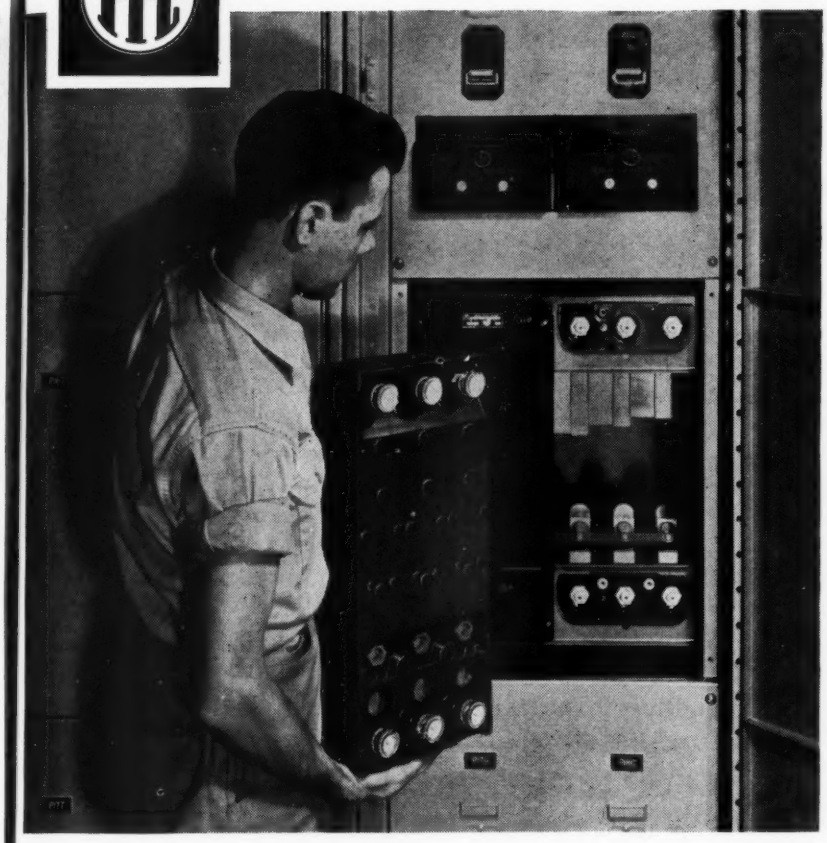
Summary

An attempt has been made to point out the shortcomings as well as the advantages of specific types of polymeric materials capable of forming protective organic coatings. Emphasis has been placed on the resin types which go into anticorrosive coatings rather than on the pigments because it is believed the average engineer is less familiar with the film forming portion of the coatings.

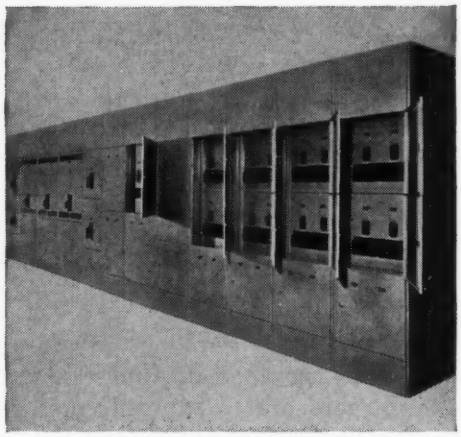
An effort has been made to demonstrate the necessity for specifying the most adaptable resinous material to each specific job. In short, organic coatings have for some time been a welcome addition to the broadening list of materials of construction. As such, as much care and planning should go into their specification and selection as for other basic materials of design.

It is not intended to imply that all problems in corrosion now can be solved by the mere expedient of applying an especially tailored organic coating system, but it is felt that with the variety of coatings available, a knowing choice will provide a protective system considerably better than that provided by a random selection.

MOLDED CASE CIRCUIT BREAKERS



I-T-E plug-in mounted "Cordon" Circuit Breakers represent the maximum in flexibility, economy and safety.

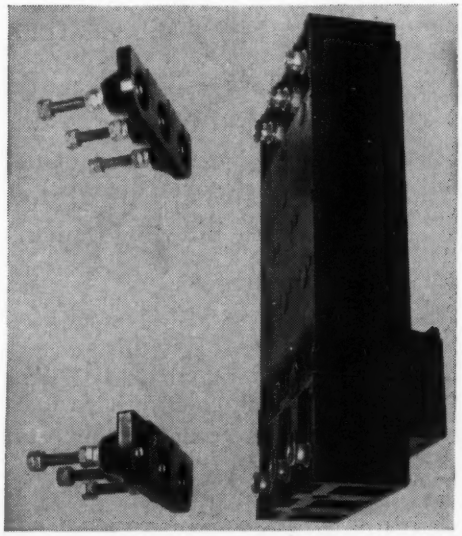


Typical switchboard installation of "Cordon" Circuit Breakers and large air circuit breakers.

I-T-E Plug-In Mounted "Cordon" Circuit Breakers Have Saved Countless Man-Hours

Plug-in mounting in switchboards provides features and advantages you get only in this modern, streamlined construction. Consider the ease of installation, the time saved in assembling switchboards. Consider the flexibility in meeting changing circuit conditions, the advantage of being able to change breakers without disturbing terminal connections. Consider, too, the added safety of concealed terminals with no live parts exposed. When you do, you'll specify switchboards with this time-proved method of installing molded case circuit breakers.

I-T-E plug-in molded case circuit breakers are available in ratings from 15 to 600 amp, up to 600 volts a-c, 250 volts d-c. Contact your I-T-E representative or leading independent switchboard manufacturers for details. Or write I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.



Used for many years in marine switchgear and approved by Underwriters' Laboratories Inc., I-T-E plug-in mounted circuit breakers require only two compact mounting blocks for switchboard installation.

I-T-E CIRCUIT BREAKER COMPANY

Small Air Circuit Breaker Division

In Canada, Eastern Power Devices Ltd.

How to Improve Engineer-Manufacturer Relations

A REPORT FROM THE COMMITTEE OF ONE-HUNDRED. Manufacturers and their sales representatives are becoming more aware of the enormous purchasing influence of the consulting engineer. They recognize, today, as never before, the importance of having their products included in the engineer's specifications. Yet many sales managers and many salesmen still do not understand the engineer-architect-contractor-owner relationship, and many more continue to use the wrong sales approach.

It would be mutually beneficial if manufacturers knew more about how the consulting engineer serves his client — and if consulting engineers gave more consideration to the very real problems of the manufacturers and their sales representatives.

In an effort to investigate the consulting engineer-manufacturer relationship and find out what can be done to improve it, we put this topic before the "Committee of One-Hundred," prominent engineers in private practice from all parts of the country. This report is a composite of their thinking. It is not the opinion of any one man on the Committee, but all of them agree with most of it, and most agree with all.

A CONSULTING ENGINEER with a small North Dakota firm says that he spends 30 percent of his time talking to salesmen and manufacturers' representatives. A large firm of engineers in New York has three full-time salesmen assigned to it by an electrical equipment manufacturer. This gives some idea of the current importance of the engineer-manufacturer relationship.

Manufacturers of engineering equipment and suppliers of materials of construction are learning that the consulting engineer is the man they must sell, for regardless of who does the actual purchasing, it is the engineer who writes the specifications.

It is true that the consulting engineer is not the only purchasing influence when a new construction project is undertaken. The owner, the architect, the contractor, and the engineer all are interested in the project and what goes into it. They make up a team working toward a goal. Yet, the inexperienced salesman frequently fails to understand the client-architect-engineer-contractor relationship.

This relationship may vary somewhat from project to project, which makes the salesman's task even more difficult. Basically, however, the consulting engineer is the man to sell if the product or material is of a type that must be selected on the basis of engineering characteristics such as strength, weight, performance, or durability; or if physical, chemical, or electrical characteristics are an essential part of the product.

In times past, when there was an architect on the project, most salesmen tended to direct their principal sales efforts toward him. This seemed reasonable, since the specifications came out of his office, and they often carried only his name on

them. Now, most salesmen recognize that structural, electrical, civil, and mechanical engineers firmly specify all the materials and equipment in their design province. In fact, the better architects are encouraging salesmen to sell to consulting engineers. They are paying for the engineer's services and they can get their money's worth only by having the engineer judge the competing products and specify the one best suited to the project. This applies also to projects on which the engineer deals directly with the owner. Then, the owner having paid the engineer his fee, naturally depends on him to select the materials and equipment.

Overruling the Engineer

Good salesmen not only realize the importance of dealing with the consulting engineer, but they also appreciate the fact that when proposals are requested by the consultant, neither the client nor the architect should be contacted. Unfortunately, some salesmen when they fail to sell the consulting engineer then feel that they should try someone else. They will rush from one office to another hoping to convince some interested party that the engineer should be overruled. It does not take many instances of this type, with the salesman being sent back to the engineer's office by the architect or owner, before he recognizes who it is that he must sell. Going over the head of a reputable engineer may occasionally result in a sale, but it does not help the salesman when the consultant's next project comes up.

It also has been noted that the salesman who does not have a good technical understanding of his product is the one who works hardest on the owner while avoiding the consulting engineer. It is only natural that a technically uninformed man will try to sell a layman rather than an engineer. If he knows his product and its applications, the salesman would rather deal with the consultant.

Sometimes it is not the salesman's fault that he fails to recognize the importance of selling the consultant. His sales training course may have unduly emphasized the owner, the architect, or the contractor. Sales managers as well as salesmen need to know the facts, for a salesman sent out with this kind of sales training may lose business for years before he finds out what is wrong.

Old and experienced companies now seem to understand the function of the consulting engineer. It is largely the newer firms, those started since the War, who misunderstand the situation and direct their salesmen to the owner or contractor.

Selling a New Product

When a salesman wants to sell a consulting engineer, exactly how should he go about it? Suppose his company has a new or improved product and he wants to call this to the attention of the consulting engineers in his territory. The first thing he should do is to mail descriptive literature to the engineer's office. It is best to address this material to a particular man or men in the office. The literature should be accompanied by a personal letter or at least a short note. The size of the office should be kept in mind and enough copies sent to go around among the interested engineers.

Then, a few days later, the salesman should telephone and ask for an appointment. If the engineer has any interest in the new product, he will agree to an interview. This procedure, sending the bulletin before making the call, is considered best because it gives the engineer a chance to study the written description and decide what questions he wants to ask the salesman. He is at a disadvantage if the salesman walks in, hands him a brochure describing a new product, and then starts to discuss it before the engineer knows what it really is. When that is done the engineer has no time to formulate intelligent questions, and he is forced to contact the salesman again at a later date for more information. The first interview has been a complete waste of time.

Calling the Factory

One of the common complaints of consulting engineers has to do with the salesman's lack of technical information. All too frequently the salesman does not have the answers to the questions, and he has to contact his factory. This is particularly true for manufacturers agents who handle several lines. Contacting the factory is better than making up answers — which some salesmen are prone to do — but the man who must constantly get data from the home office wastes everyone's time.

While there are good salesmen who know their product and all of its applications, consulting engineers often find that they learn more from bulletins than they do from personal calls. It is discouraging for the engineer to find that after studying a brochure for a few minutes he knows more about a product than the salesman does. The engineer is, however, tolerant of the young salesman learning his business.

When the salesman is in an engineer's office he should confine his conversation to relevant topics. Consulting engineers are extremely busy men. They do not want to talk about golf, fishing, or the weather. They want information, not conversation. It is surprising how often the consultant wants to talk about the new product while the salesman insists on talking about practically anything else. As a general rule the salesman who has something important to say can say it quickly. The salesman with nothing to say talks on and on.

Consulting engineers seem to be conscious of many of the salesman's problems. Engineers who have offices in small towns off the usual route are extremely considerate in arranging interviews for

out-of-town salesmen. A little bit of warning, however, is appreciated. Some salesmen and manufacturers' representatives now are mailing out postcards a week or so ahead to let engineers know when they are going to be in town. Not only does this make it more likely that the engineer will grant an appointment, but it also gives him an opportunity to study the product and compose intelligent questions. More companies should suggest that their salesmen use postcard announcements.

Consulting engineers say that they prefer frequent brief calls from a salesman who has something to say rather than lengthy interviews at six month intervals at which time the salesman tries to unload everything that has accumulated since his last call.

Demonstrations and Tests

Consulting engineers also like demonstrations of new products. This may amount to nothing more than a quick desk top show, but it may, at the other extreme, require a field test or a factory visit. Many firms are giving full demonstrations of new products at luncheons or evening meetings. These more elaborate presentations should follow a direct mail or magazine advertising campaign. Here, again, the engineer finds that he needs some prior information before he attends a demonstration. He must have time to study the product and decide what it is he wants to know.

The consulting engineer appreciates good sales techniques. Models, motion pictures, slides, and recordings all have been successful in selling engineers on the advantages of a new product. The salesman should recognize, however, that verbal sales presentations are open to misinterpretation. The engineer particularly wants accurate and complete written information for his files.

Timing of these demonstrations is important. Engineers do not want to have to listen to a long story about a product that is in the experimental stage and will not be available to them for months. And they are not interested in the manufacturer's research or production problems. They want to know what the finished product will do.

Getting to See Him

Consulting engineers seem to be quite reasonable about seeing salesmen. Very few have special days or special hours for sales calls. They do ask that the salesman telephone before he calls if the interview is going to be lengthy. On the other hand, if the salesman merely wants to drop by with a bulletin, even the telephone call is not essential for most offices. He may not see the man he wants, but he can leave the bulletin.

When a salesman really has something to say, the consulting engineer will go to considerable length to give him a good hearing. Most consultants are happy to set up group meetings of the interested staff members when a salesman has a demonstration to make or particularly important information to talk about. It is better, however, for these meetings to be in connection with a luncheon or a dinner. This saves working hours.

There is one consulting firm that puts aside the time between five and seven, one day each week, so salesmen can talk to the entire engineering staff. Another firm gets out a daily mimeographed sheet to all engineers on the staff showing what salesmen called, what brochures they left, and who interviewed them. Then, any interested engineer not only knows that the bulletins are available, but he can contact the particular engineer who interviewed the salesman and discuss the product.

While engineers are anxious to cooperate with sales representatives, giving them all of the time that they need for individual or group interviews, there are frequent complaints that after meetings are arranged and valuable working time is given up, the presentation turns out to be worthless. This waste of time is not appreciated.

Delivery Dates

For many years engineers have been having trouble with manufacturers who fail to meet promised delivery dates. It is hard to pin down the guilt when the promises are not fulfilled. Sometimes the salesmen are at fault, for they are inclined to make optimistic promises over which they have no control. Sometimes they even promise dates which they know cannot be kept and then blame their company when the delivery is not made. On the other hand, investigation frequently shows that the failure is the company's fault. Either way, the consultant and his client are the losers. Many engineers now have learned to request a letter of verification from the company when delivery date is of real importance. Some even insist that a percentage price reduction based on delivery date be written in the contract.

There is nothing much the engineer can do about this sort of thing except to note which companies consistently fail to meet the delivery date promised by the salesmen. Then, he can specify another manufacturer's equipment in the future. One consulting engineer pointed out that he usually favored one manufacturer's product in the heat exchanger field, but that when delivery date is of importance he has to go to a competitor because experience has proven that the preferred equipment never reached the project at the promised time.

Catalogs and Bulletins

Catalogs are more important to consulting engineers than slide rules. Many say they would rather work with a good catalog than a good salesman. Keeping his company's catalogs current is the salesman's responsibility, yet it is a responsibility that often is shirked. One large engineering firm states

that less than 10 percent of the suppliers with whom they deal send out new catalogs or keep their catalogs properly up to date. "Lousy, and getting worse," is another engineer's comment on this. Larger consulting firms have library staffs to keep catalogs up to date, and even then it is difficult to get the manufacturers and their salesmen to cooperate. Smaller firms have an even more difficult task because it takes the time of their top engineers to separate the trash from the new catalog pages in the morning mail, and then file them properly.

The wise salesman is vitally interested in keeping all of his customers' catalogs in good shape. When new catalog pages are printed, the salesman should go to each engineer's office and personally insert the new pages in each binder and remove the old pages that are being replaced. If he is delivering a new brochure, he should make sure the old ones are removed from the file. If a personal call is impractical, then a personal letter should accompany the new brochure or catalog sheets telling the engineer where they should go in his file and which old bulletins or pages should be removed.

Unethical Practices

If salesmen have generally failed to understand the importance of catalogs, they do seem to have learned one most important fact about consulting engineers. Ten or twenty years ago it was not at all unusual to have a salesman call and offer an unethical deal in which he or some engineer from his company would take over part of a project's design work if the consultant would promise to specify his company's equipment. This unethical practice has almost died out. Only the rawest, greenest salesman would try that sort of deal on a consulting engineer. Occasionally borderline cases do arise, but even these are infrequent. Almost every consulting engineer admits that it has been many years since any salesman has attempted outright bribery or offered some form of kickback. Salesmen should be given credit for recognizing the professional status of the engineer and his high ethical standards.

Entertainment and Gifts

Neither the consulting engineer nor the salesman seem to have any clear concept as to exactly when entertaining or the giving of gifts goes beyond friendliness and borders on bribery. There is nothing unethical, it would seem, about an occasional lunch or dinner. A token gift at Christmas is usually acceptable. Many consulting engineers have found it necessary, however, to return expensive gifts that are obviously more than tokens of friendship. Also, it is generally agreed that long weekends, vacation trips, and elaborate entertainment are unacceptable.

The engineer would like to think that luncheons or dinners are for the purpose of getting better acquainted with the salesman and his products. He never wants to feel that he has been put under any kind of obligation to either the manufacturer or his representative. This whole matter is largely a question of good taste and no one seems to have the final answer. As one engineer said, "I am on a diet, I do not drink or smoke, and I am no longer attractive to women. Therefore, I am no judge as to when entertainment becomes bribery."

Large or Small

Neither the large company nor the small firm can be given a clear decision when it comes to sales techniques. Where the products are of equal quality, the larger companies seem to have a slight edge in most parts of the country. Their men are frequently better trained; there is a better thought-out advertising program to support them; and the salesmen are backed up by more experts in the sales departments. Also, many of the smaller companies have not yet learned of the importance of selling the consulting engineer.

This, however, is only one side of the coin. A good salesman with a small company manufacturing a good product has many advantages. His approach can be more personal. There is usually less turnover among sales representatives, and longer and friendlier relations are established. The real answer seems to depend upon the personality, intelligence, and training of the sales representative.

Check Lists

Currently, relations between consulting engineers and manufacturers seem to be better than they ever were, and conditions are improving constantly. How-

ever, there is much that the manufacturer, his sales representative, and the consulting engineer, himself, can do to their mutual advantage.

First here is a Better Relations Check List for manufacturers:

¶ The manufacturer should stick to manufacturing and leave designing to the consulting engineer. Offers of "free engineering" by the manufacturer can cause nothing but trouble. Instead, the manufacturer should always recommend that the owner secure the services of a reliable consulting engineer. The manufacturer who offers to do the engineering "free" is making an offer that is always unethical and frequently illegal.

¶ The manufacturer should see to it that his salesmen are thoroughly trained in the technical aspects of the equipment they are selling. It is a great waste of time if the salesman must go back to the home office or factory for further information. To make matters worse manufacturers have a discouraging tendency to put their least experienced salesmen in the most distant territories. These salesmen are the least able to answer technical questions, yet they are farthest from the source of data.

¶ Better talent is needed in the preparation of technical bulletins and catalogs. All too much space is given to pretty pictures and wild claims, when the same space could better be devoted to clear drawings and factual data.

¶ For some reason manufacturers do not seem to understand that price is important. Few are inclined to include any suggestion of price in their catalogs or bulletins. A good piece of descriptive literature not only should include prices of the equipment but also it should give some indication of installation and operation costs. Good bulletins also warn against misapplication.

¶ Manufacturers should get together and work with consulting engineers in the preparation of a usable catalog filing system such as the Producers' Council and the American Institute of Architects have worked out. An indexing system applicable to engineering equipment and materials is much needed.

¶ Trade magazine advertising should contain more technical data and more factual information.

¶ More manufacturers should give credit to consulting engineers in their advertising when such credit is due. All too frequently the illustration of a new plant or office building carries with it the name of the architect and contractor but no mention of the consulting engineer. Strangely enough, this is true even when the products being advertised are engineering items.

¶ The manufacturer must make every effort to meet promised delivery dates.

¶ He should back up his sales representatives with a service department that will follow through after every sales to see that the equipment is functioning properly for the owner.

The sales representative also can do much to improve the engineer-manufacturer relationship. He should:

¶ See to it that the consulting engineer knows about all new or improved products as soon as they come on the market and furnish the consulting engineer with the basic literature before making his sales call to tell about the new product.

¶ Telephone whenever possible to make an appointment before making a call.

¶ Make his calls as short as possible, confining his conversation to relevant topics.

¶ Know his product and how it should be applied.

¶ Do everything within his power to encourage the use of consulting engineers' services.

¶ Never go over the engineer's head or behind his back to make a sale.

¶ Keep his company's catalogs and bulletins in the engineer's office up to date.

¶ Recognize that consulting engineers have projects in distant parts of the country and be willing to give sales and product data to the engineer even though the sale will take place outside of his territory and he will not get the commission. (Some manufacturers improve this situation by arranging for a split commission when the consulting engineer is in one territory and the project is in another.)

¶ Study the engineer's specifications to make sure that the product he is selling will fit.

¶ Be truthful about delivery dates and prices and follow-up on all orders to see that his company is doing everything possible to fill the order correctly and promptly.

¶ Check with the contractor during installation and then follow up later to see that his equipment is giving the owner good service.

What the Consultant Can Do

The consulting engineer also has a responsibility to the salesman and the manufacturer. He should:

¶ Recognize that the salesman's time is valuable and that once an appointment is made it should be kept promptly and the salesman given a full hearing so long as he has something to say.

¶ Be willing to test new products and listen to new ideas.

¶ Realize that a good salesman knows his product and can provide him with a great deal of valuable product information.

¶ Always expain why he could not use a particular product when it was eliminated from the specifications. The salesman has a right to know.

¶ Tell the salesman immediately when the product is not of interest. Avoid waste of time.

All of the parties should remember that consulting engineers, sales representatives, and manufacturers are all men with the virtues and faults of men. While no two in any group are alike, most of them are fine men, competent in their fields. ▲▲

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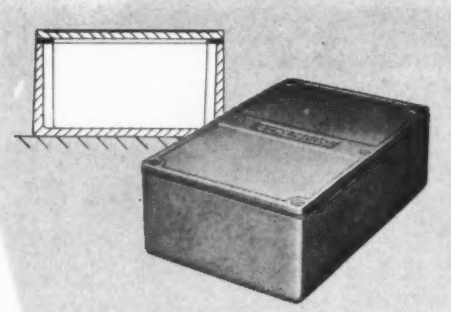
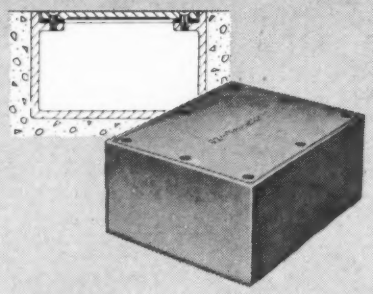
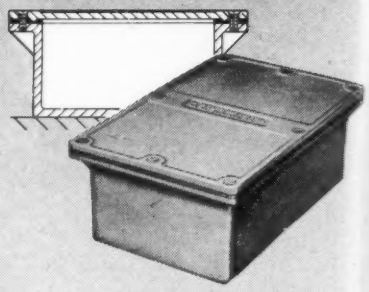


Type "YS" This unit is unflanged for surface mounting, and it is Dust-Tight and Weatherproof. The simplest in design of all the Cast Iron Boxes in the broad O.Z. line, the Type "YS" is also the most popular and the most widely used. UL approved. 133 sizes.



Type "YU" A Recessed Cover Junction Box, the Type "YU" is designed especially for flush mounting in masonry. Weatherproof and Dust-Tight, the box has an inside flange and recessed cover. UL approved. 43 sizes.



Type "YF" UL approved as Raintight, the "YF" is Watertight and submersible under a 20 foot head of water. Designed for outdoor use, this unit is recommended wherever a watertight installation is required. 78 sizes.

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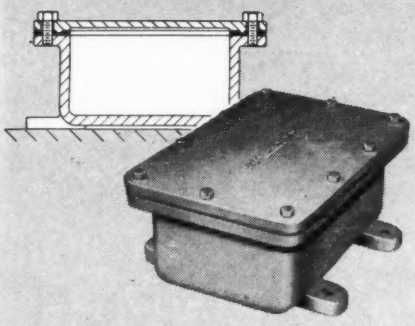
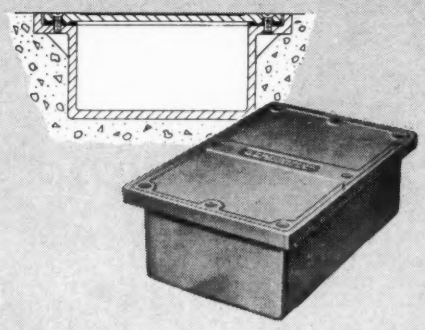
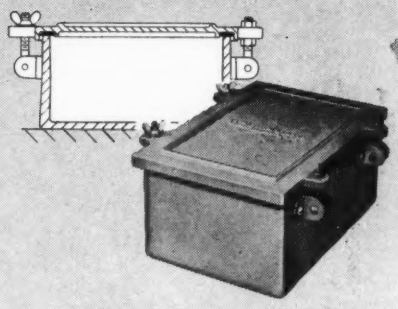


Type "YH" This is a heavy duty box, with extra-thick walls. It is listed by the Underwriters' Laboratories, Inc., as Raintight. Type "YH" boxes are submersible under a 50 foot head of water. 80 sizes.



Type "YR" An outside flanged recessed cover box, approved by the Underwriters' Laboratories, Inc., as Raintight, the Type "YR" is designed for flush mounting in walls or floors. 45 sizes.



Type "YW" A hinged cover box, the Type "YW" makes an ideal enclosure where equipment within the box must be inspected frequently and easy access is required. This unit has been approved as Raintight by Underwriters' Laboratories, Inc. 110 sizes.

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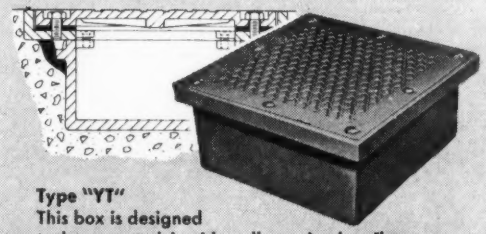
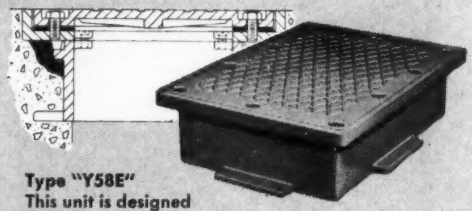
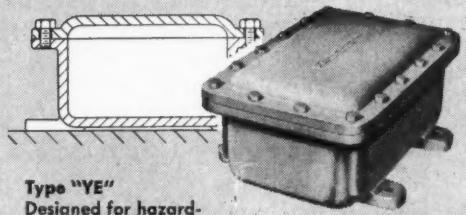


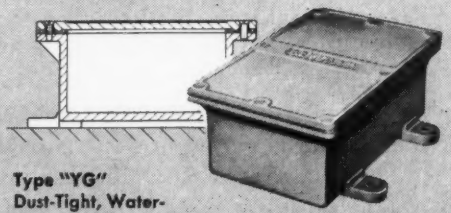
Type "YT"
This box is designed to be mounted in sidewalks and other flat concrete surfaces. The checkered cover has reenforcing ribs and is made to withstand pedestrian and light vehicular traffic. 33 sizes.



Type "Y58E"
This unit is designed to top off an underlying concrete pull box. The flange and cover can be replaced without disturbing the box the same as the Type "YT". 5 sizes.



Type "YE"
Designed for hazardous locations, Class I, Group D. Type "YE" boxes are Explosion-Proof, Dust-Tight, and Weatherproof. All joints are of the metal to metal type, ground to exceptionally close tolerances. 80 sizes.



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Giving Free Advice Can Cost You Plenty

ALBERT WOODRUFF GRAY

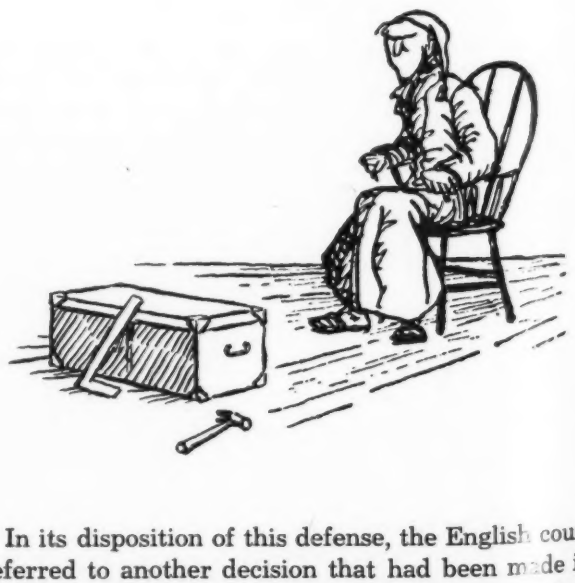
SINCE HE IS ACCEPTED by the public as a man with special knowledge and skill, the consulting engineer must be extremely careful in giving free advice carelessly. Most persons who are not intimately familiar with the law automatically would assume that they would not be held liable for damages arising from advice freely given, but this is only partially true. If a doctor or a school teacher were to walk by a construction job and give one of the workers some advice as to how a pipe should be installed and then the plumbing system fell apart at that point, damaging the property, the doctor or the school teacher probably would not be liable in any way. They are not experts, and there was no reason for the construction worker to think that he was receiving expert advice from them. On the other hand, if a consulting engineer were walking along the street and stopped at the same construction job, he could well be held liable if it could be shown that he had told the construction worker that he was an engineer and left the impression that he was an expert and knew what should be done.

Every engineer should understand this principle of the law, and his errors and omissions insurance should be written to take care of free advice as well as regular work unless he is proficient at keeping his mouth tightly closed until he is paid to open it.

This principle of law is nothing new. Referring to a rule as old as English law itself, Justice Frankfurter, in a recent decision of the United States Supreme Court, said that one voluntarily assuming any undertaking "must perform his 'Good Samaritan' task in a careful manner."[1]

Several hundred years before this comment was made in this recent Supreme Court decision, suit had been brought in an English court by the owner of several hogsheads of brandy against a man who had undertaken gratuitously to transfer this brandy from one cellar to another. In the performance of the task, one of these hogsheads was staved in through carelessness, and the brandy was lost.

In his defense to this suit the man contended that since he had been paid nothing for his effort and had undertaken to move these hogsheads gratuitously he could not be held liable for the loss.



In its disposition of this defense, the English court referred to another decision that had been made in the days of Henry IV. In that suit a carpenter had promised to build a house but had not done so. The

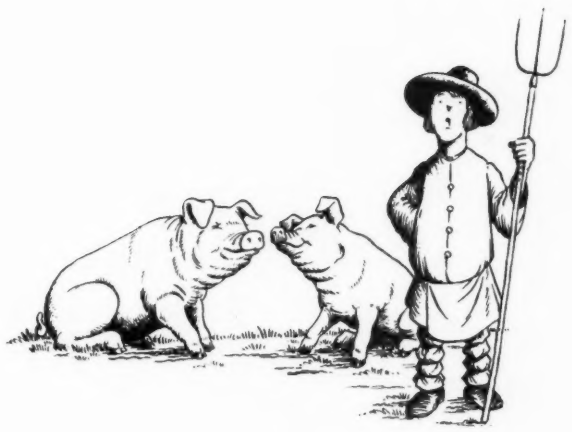
court in its decision held that this man had not undertaken the work and therefore he was not liable in damages. But on the other hand, had he undertaken its performance and had he been negligent in so doing, he would have been liable in damages to the owner even though he had done the work on a voluntary basis.[2]

When later a controversy of this character came before the courts of this country, our court agreed that there was a well settled distinction between claims for damages for a failure to act, and claims that arise in connection with acts that were performed in a negligent manner.

"When one party entrusts the performance of a business to another who, without consideration, undertakes but wholly omits to do it, no action lies notwithstanding the party may have suffered special damages." On the other hand, added the court, "If the party enters upon the execution of the business and does it amiss through the want of due care by which damage ensues to the other party, an action will lie for wrong doing."[3]

More recently, in New Hampshire, a physician volunteered his advice without compensation. His instructions thus carelessly given, were followed by the receiver who, as a consequence, became seriously ill. In its comment on these circumstances, the Supreme Court of that State said that when this physician assured the woman she was in no danger from infection, even though he had done so voluntarily, he assumed certain obligations for which he might be held responsible in damages.

"When he advised her, he assumed the obligation to use due care in doing so. The gratuitous character of the services . . . would not excuse his failure to exercise such care as the circumstances demanded."[4]



Essentially the same situation arose later before the New York courts. There, a manufacturer had voluntarily assumed the task of instructing a farm worker in the operation of a tractor, but he failed to warn the worker of latent dangers, and suit was brought against the manufacturer for his failure to observe this centuries old rule of law.

Here the court held this volunteer answerable for the injuries incurred from negligence, stating in the decision, "Liability for negligence rests on the principle that if a person undertakes to do an act or discharge a duty by which the conduct of another party may be properly regulated and governed, he is bound to perform it in such a manner that those who are rightfully led to a course of conduct or action on the faith that the act or duty will be duly and properly performed, shall not suffer loss or injury by reason of his negligence."[5]

Public weighers in New York City at one time furnished a purchaser of merchandise, gratuitously and purely as a favor, the weight of merchandise on which his payment should be computed. On one occasion the figures furnished were between eleven

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and twelve thousand pounds in excess of the actual weight. Suit was later brought for a recovery of the damages incurred.

In their defense these weighers contended that the furnishing of this weight was a gratuitous service on their part for which this buyer had paid nothing and that by virtue of that circumstance their error was no basis for a claim for damages.

In its conclusion holding the misled buyers entitled to a recovery of their damages, the court said, "It is ancient learning that one who assumes to act, even though gratuitously, may thereby become subject to the duty of acting carefully if he acts at all."[6]

Being guided by that long ago decision of the English court awarding damages for the staved in hogshead of brandy, the New York State Court of Appeals 100 years ago said, "It has been held that when the condition of the party charged is such as to imply peculiar knowledge and skill, the omission to exercise such skill is equivalent to gross negligence." This comment was supplemented with reference to another early English ruling that, "if a man gratuitously undertakes to do a thing to the best of his skill when his situation or profession is such as to imply skill, an omission of that skill is imputable to him as gross negligence."[7]

It is clear then that under the common law an engineer who undertakes to do a service for another without reward is not answerable for omitting to do the service, but he is answerable when he attempts to do it and does it amiss. In other words, he is responsible for a wrong doing but not for a non-doing.

Only a few months ago the United States Court of Appeals said, in holding the Federal Government liable in damages for the failure of the Coast Guard properly to effect a rescue by helicopter, "The law imposes an obligation on everyone who attempts to do anything, even gratuitously, for another, not to injure him by the negligent performance of that which he has undertaken."[8]

In view of all these rulings, the consulting engineer must be extremely careful about his "Good Samaritan" services, and he must be prepared to accept as much liability for these as if he had been paid a full fee. ▲▲

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6. Glanzer v. Shepard, 135 N.E. 275, New York, April 18, 1922.
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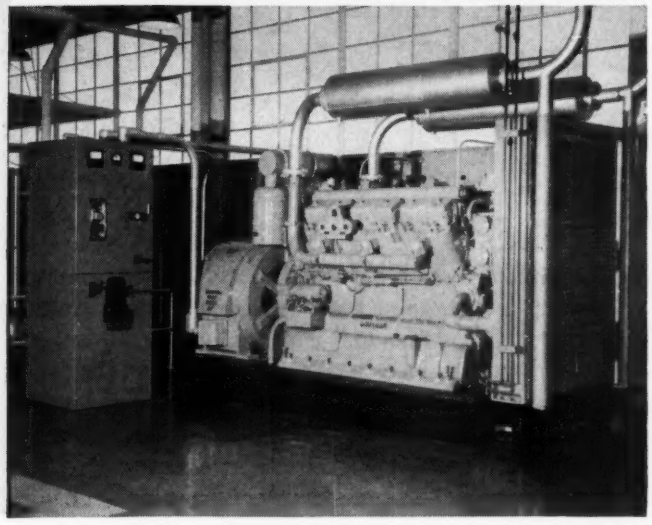
Is a hospital really complete without dependable standby power?



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MODERN STANDBY ELECTRIC POWER

The Engineering Mind of Abraham Lincoln

EARL C. KUBICEK
Director, Alumni Relations & Placement
Illinois Institute of Technology

LINCOLN'S LAST LAW PARTNER, William H. Herndon, in his lecture, "An Analysis of the Character of Abraham Lincoln," first delivered at Springfield, Illinois, on Dec. 12, 1865, said of Lincoln, " . . . his mind ran back all facts, things, and principles to their origin, history, and first cause . . . He would stop in the street and analyze a machine or other thing, mechanical or other power, as exhibited in a wagon, a threshing machine, or a lightning flash . . . clocks and words, omnibuses and language, paddle wheels and idioms never escaped his observation."

That Lincoln was a good mechanic there is no doubt. Even after his entry into public and professional life, his interest in mechanics and invention never left him.

Lincoln sometimes helped his father in carpentry work, though he never professed any great love for the draw-knife and hammer. He and his father built a wagon for James Gentry, constructing it, "entirely of wood even to the hickory rims on the wheels." Under the guidance of his father, an experienced carpenter, he constructed a scow which he operated near the mouth of Anderson's Creek, in Indiana, to take passengers from the shore to the steamers as they passed through in the mid-channel of the Ohio River.

Through his boat station passed the lawyers coming from the East, bringing with them the learning of books, the logic of law. There were the hunters, the men of the forest, with their tales of the frontier, and the circuit riders with their promise of an even greater frontier for the favored few.

These adventurers in understanding undoubtedly whetted the imagination of young Abraham Lincoln. Miss Kate Roby, who knew him in the early Indiana days, told of sitting on the river bank with Lincoln, with a full moon in the heavens, and talking of the movements of the planets.

He surprised her with his knowledge of planetary motion, explaining, "We do the sinking while to us the moon is comparatively still. The moon's sinking is only an illusion."

Miss Roby confessed later that she had then dubbed him a fool. "He was well acquainted with the general laws of astronomy," she said, "and the movements of the heavenly bodies, but where he learned so much or how to put it so plainly, I never could understand."

A clue to Lincoln's learning might lay in his close association with those who had gone further than he in formal education and in his ability to learn from them. The Grigsby family (Aaron Grigsby married Lincoln's sister Sarah) all seem to have attended schools outside of the state. Aaron Grigsby studied law, attending school 2½ years. It is likely that he attended Hampton-Sidney, in Virginia, as this college was near the ancestral home of the Grigsby's.

Reuben Grigsby studied surveying, and it is believed that Lincoln borrowed Reuben's books. James Blair's granddaughter is our authority for the statement that Lincoln was coached in the study of surveying by Blair, who had received his education in the East before he moved to Indiana.

Lincoln's skill as a flatboatman was well known, and came to the attention of one Denton Offutt, an

early promoter. It was he who hired Abraham Lincoln, John Hanks, and John D. Johnston, Lincoln's step-brother to take a flatboat laden with provisions from a village called Springfield, Illinois, (p.500) to New Orleans. When his navigators arrived at the place of assembly, Offutt did not have the promised boat, but he offered to pay them extra if they would construct the craft for him. His offer was accepted by the trio and the boat built.

In Lincoln's words, "We found Offutt at Springfield but learned that he had failed in getting a boat at Beardstown. This led to us hiring ourselves to him for $12 per month, each, and getting timber out of the trees and building a boat at Old Sangamo Town on the Sangamon River, seven miles northwest of Springfield, which boat we took to New Orleans, substantially upon the old contract."

Fast on Rutledge's Dam

An important incident took place during the journey. Uneventful passage was made down the river until the New Salem dam was reached. Then, as John Hanks recorded it, "We landed at New Salem mill about April 19th, and got fast on Rutledge's mill dam." The boat was stuck fast on the mill dam with one end dipping into the water, the other jutting high into the air.

They first unloaded some of the provisions. Then Lincoln went into New Salem village, borrowed an augur, and bored a hole in the low end of the craft to allow the water that had been shipped aboard to run out. The high end came down; the low end went up, and the boat passed over the dam.

Lincoln then capped the hole, his companions reloaded their provisions and, to the cheers of the assembled villagers, continued their journey toward New Orleans.

The impression this little hamlet on a hill made on Lincoln during his short visit was evidently favorable, for in the summer of 1831, following his return from the New Orleans expedition, he decided to make New Salem his home.

If New Salem had impressed Lincoln, Lincoln also had impressed his employer Offutt, who told all who would listen that he would soon have a steamboat running up and down the Sangamon River with Lincoln as her captain. "Then by thunder," Offutt said, "she'd have to go."

Offutt, however, was a man who had trouble getting boats, and Lincoln found short-term employment with a Dr. Nelson of the village who was removing, with his family and goods, to Texas. Lincoln was hired by Dr. Nelson to pilot a vessel through the Illinois River loaded with the household goods of the family. Upon their arrival at Beardstown, Illinois, Lincoln was dismissed, having brought the Nelson family safely through this portion of their journey. Lincoln returned, across the sandhills, to his new home at New Salem.

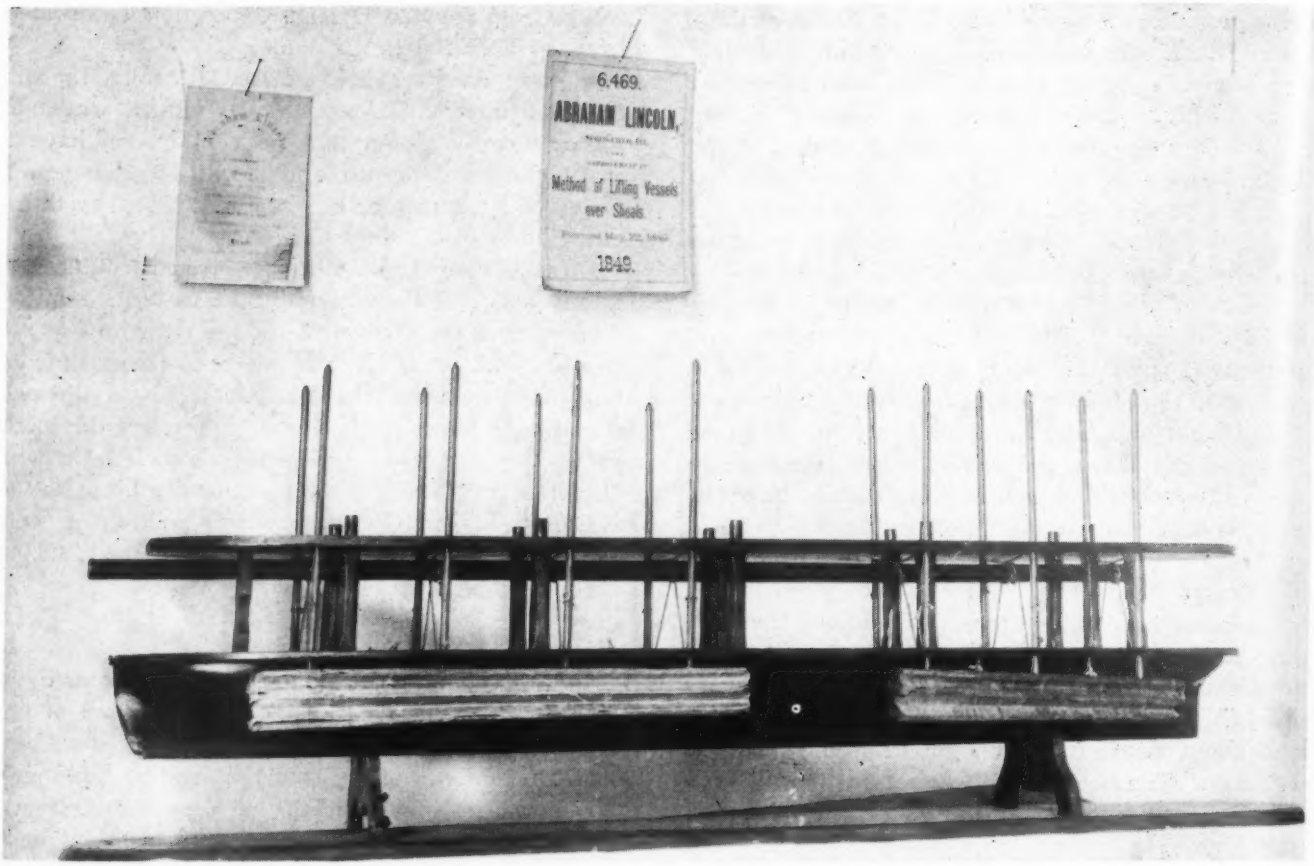
Political Promises

Politics, as practiced in those early frontier days, was both a means of livelihood and a kind of entertainment for an amusement-starved people. Abraham Lincoln was always popular, and he had many acquaintances in the vicinity of New Salem. It was not unexpected when he announced his candidacy, on March 9, 1832, for the legislature of the State of Illinois. There was a deep-seated community interest in the navigability of the local rivers, and Lincoln called to the voter's attention his intimate knowledge of these waters in his opening campaign speech.

"From my peculiar circumstances it is probable that for the last 12 months I have given as particular attention to the stages of the water in this river as any other person in the country. In the month of March, 1831, in company with others, I conceived the building of a flatboat on the Sangamon and finished and took her out in the course of the stream. Since that time I have been concerned in the mill

MARKER SHOWN AT LEFT IS ON PUBLIC SQUARE OF HURON, ILL., A PLOT SURVEYED BY LINCOLN.

THE TOWN OF BATH, ILL., WAS LINCOLN'S LAST RECORDED SURVEY, MADE IN NOVEMBER, 1836.



LINCOLN BUILT THIS MODEL IN CONNECTION WITH HIS PATENT ON A METHOD FOR LIFTING VESSELS OVER SHOALS.

at New Salem. These circumstances are sufficient evidence that I have not been inattentive to the stages of the water."

Lincoln also expressed the idea that a railroad, connecting Sangamon County with other parts of the State of Illinois was, in his words, "indeed a very desirable object," but as to the cost or its technical practicality he had no comment.

Lincoln discussed the geography of the river and the possibilities for improvements in its channel and pledged himself toward river improvements in appropriate measures brought before the legislature. This initial venture in soliciting public favor was not too successful, but he soon was engaged in other activities that took his mind off of his defeat.

In the winter of 1832, a steamer, *The Talisman*, was advertised to leave Cincinnati, Ohio, sail up the four rivers, and eventually reach New Salem, Illinois, bringing to the people of that farming community "goods directly from the East."

Men of the New Salem community, among them Lincoln, met the boat part way and helped to clear brush along the river banks to allow safe passage. Following an extended stay at Springfield, receding waters in the river warned the officers of the steamer that the return journey should begin immediately.

Lincoln was engaged as pilot for the craft, and the return journey was undertaken, but again the New Salem mill dam intervened. A local poet expressed in rime what happened:

"And when we came to New Salem dam,
Up against it we went jam;
We tried to cross with all our might,
But found we couldn't, and staid all night."

This time Lincoln took no part in the negotiations that followed between the steamer's officers and the partners, Rutledge and Cameron, owners of the mill and dam. Eventually part of the dam was taken down, and the boat passed through. The incident was forgotten except in the folklore of the region.

Deputy Surveyor

John Calhoun, of Springfield, was the surveyor of Sangamon County. The constant influx of immigrants into Illinois made Calhoun's office a very busy place, and he soon declared himself in need of a deputy surveyor. A mutual friend of Calhoun and Lincoln brought them together and, while Calhoun was a Democrat and Lincoln a Whig, and Lincoln was not too well versed in the science of surveying, Calhoun appointed him deputy surveyor, responsible for all surveys in the immediate vicinity of New Salem — provided that he apply himself to the study of surveying and prove himself capable.

Lincoln laconically states his version of the story. "The surveyor of Sangamon County offered to de-

pute to Abraham that portion of his which was within his part of the county. He accepted, procured a compass and a chain, studied Flint and Gibson a little, and went at it."

This phrase, "studied Flint and Gibson a little," expresses a certain amount of modesty, for it was no mean chore. In Gibson's *Surveying* there are chapters on Decimal Fractions, Involution and Evolution, Geometry, Trigonometry, Mensuration of Areas, Leveling, and Instruments — plus tables.

The Study of Surveying

Mentor Graham, the village schoolmaster, said "Lincoln came to live with me and continued for about six months." This was in February, 1833. Mr. Graham claims to have taught Lincoln, among other things, the rules of surveying. Graham's daughter recalled that her father and Lincoln often sat up in the cabin until midnight. So engrossed were they in their calculations, they were only aroused when driven forth by her mother after fresh wood to replenish the dying fire that had wholly escaped the attention of the interested scholars. He applied them so well in his work that no survey of his was ever subjected to questioning, in a period when lawsuits over land were common procedure.

When Calhoun's term of office as surveyor expired in 1835, his successor, Thomas M. Neale, at once reappointed Lincoln deputy. In the *Sangamo Journal* of September 12, 1835, Thomas Neale advises his customers that, "I have appointed John B. Watson, Abraham Lincoln, and John Calhoun, Deputy Surveyors for Sangamon County." He gives us some interesting sidelights in his statement, "In my absence, persons wishing their land surveyed will . . . call at the Recorder's Office and enter his or their names in a book left for that purpose . . . and their business shall be promptly attended to."

In The Field

There are records of Lincoln's surveys of the towns of Petersburg, Bath, New Boston, Albany, and Huron, Illinois. The early surveying records are scattered, but it is established that three roads, three school sections, and many pieces of farm land of various sizes are Lincoln's work.

R. B. Rutledge, a New Salem neighbor, gives us a description of Lincoln at work in the field. "When Lincoln was engaged in surveying he wore jeans or pantaloons, 'foxed' or covered on the forepart and below the knees behind with buckskin. This added to the warmth, protected against the rain, and rendered them more durable in performing the labor necessary to his calling."

In November, 1834, it seemed that Lincoln's days as a surveyor were to end suddenly through the loss of the tools of his profession. Debts were the only legacy accruing to Lincoln as a result of his days as a storekeeper in New Salem, and there were judgments against Lincoln when the Lincoln & Berry partnership failed.

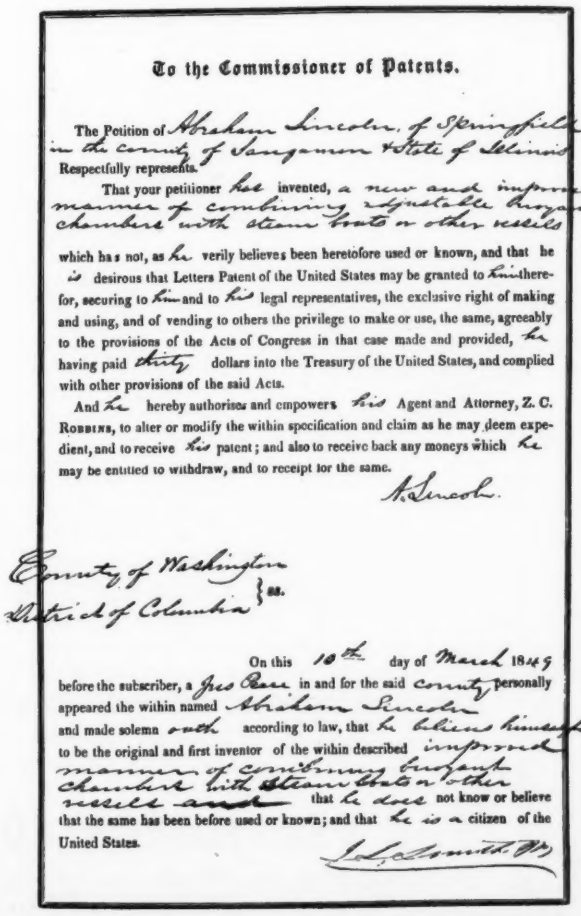
The sheriff attached his horse, saddle, bridle, and surveying instruments when he was unable to satisfy the judgments. When the articles were sold, "Uncle Jimmy" Short of Sand Ridge, one of Lincoln's New Salem neighbors and a friend, bid in and secured the property, promptly returning it to Lincoln.

This little story in friendship had its happy ending. Many years later, when Lincoln was President, "Uncle Jimmy" moved to California and lost everything he owned. When Lincoln heard of his condition he returned the earlier favor by appointing him an Indian Agent.

Lincoln's last recorded survey was of the town of Bath made in November, 1836, for John Kerton, proprietor. Lincoln, in a speech delivered in Bath, on August 16, 1858, reminded his audience that nearly 22 years earlier he, with his own hands, staked out the town from wooded wilderness.

Interest in Mechanics

Lincoln's interest in things mechanical grew steadily. As a freshman Congressman from Illinois, the Hon. Abraham Lincoln presented the petition of one Uriah Brown, "praying for further testing of his discovery of 'Liquid Fire' to be used in na-



To the Commissioner of Patents.

The Petition of Abraham Lincoln, of Springfield in the county of Sangamon & State of Illinois Respectfully represents.

That your petitioner has invented, a new and improved manner of combining adjustable buoyant chambers with steam boats or other vessels which has not, as he verily believes been heretofore used or known, and that he is desirous that Letters Patent of the United States may be granted to him therefor, securing to him and to his legal representatives, the exclusive right of making and using, and of vending to others the privilege to make or use, the same, agreeably to the provisions of the Acts of Congress in that case made and provided, he having paid thirty dollars into the Treasury of the United States, and complied with other provisions of the said Acts.

And he hereby authorises and empowers his Agent and Attorney, Z. C. Robbins, to alter or modify the within specification and claim as he may deem expedient, and to receive his patent; and also to receive back any moneys which he may be entitled to withdraw, and to receipt for the same.

A. Lincoln.

County of Washington
District of Columbia } ss.

On this 10th day of March 1849 before the subscriber, a Jus Pace in and for the said County personally appeared the within named Abraham Lincoln and made solemn oath according to law, that he believes himself to be the original and first inventor of the within described improved manner of combining buoyant chambers with steam boats or other vessels and that he does not know or believe that the same has been before used or known; and that he is a citizen of the United States.

LINCOLN'S PATENT APPLICATION FOR THE DEVICE.

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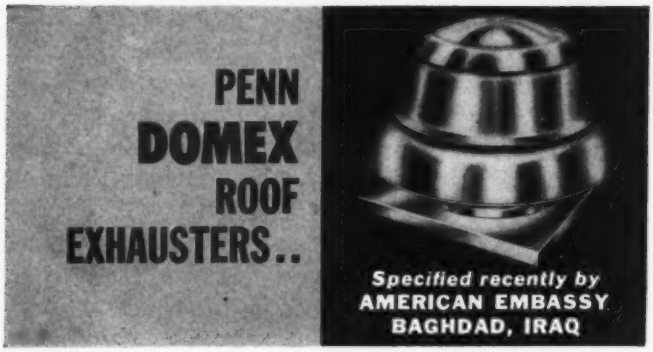

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tional defense." The petition was referred to the Committee on Naval Affairs.

When the Lincolns returned from Washington to their home in Springfield their trip was a leisurely one through New England, Canada, and Niagara Falls. At the Falls Lincoln speculated on the possibilities for their commercial use for power. Their trip continued westward through Detroit and then by boat to Chicago.

It was on this Great Lakes portion of the homeward passage that an incident occurred which set Lincoln's inventive mind to work on the creation of a device to be used on boats.

The boat on which the Lincolns were passengers was stranded on a sand bar. The captain, ordering the use of planks, boxes, and barrels forced under the boat, finally succeeded in freeing the craft. We are told of Lincoln's deep interest in the proceedings. He made several suggestions to the officers directing the operations, and these were accepted by them.

Lincoln's Invention

Mr. Lincoln, immediately upon his return to Springfield, while the incident was still fresh in his mind, contacted Walter Davis, a mechanic whose shop was located near the law office. He arranged with Davis for the use of his tools and shop and assistance in making a model of a river vessel.

Lincoln applied for a patent for his device. His application reads, "What I claim as my invention, and desire to secure by patent letters, is a combination of expansible buoyant chambers placed at the sides of a vessel with the main shaft or shafts by means of sliding spars, which pass down through the buoyant chambers and are made fast to their bottoms and the series of ropes and pulleys or their equivalents in such a manner that by turning the main shaft or shafts in one direction the buoyant chambers will be forced downwards into the water, and at the same time expanded and filled with air for buoying up the vessel by the displacement of water. By turning the shafts in opposite direction the buoyant chambers will be contracted into a small space and secured against injury."

The patent application was made on March 10, 1849, and Lincoln was granted his patent rights on May 22, 1849. His law partner, William H. Herndon, tells of Lincoln's great interest in what he believed to be the almost unlimited possibilities of his invention and of his working on the idea in their office and explaining its principles.

Herndon, however, did not take too much stock in his partner's idea and wrote, "This invention was a perfect failure; the apparatus has never been put on any boat so far as is known." He hedged on his statements, however, and qualified his remarks by saying, "Although I regard the thing as impractical, I said nothing, probably out of respect for Lincoln's well known reputation as a boatman."

The Lincoln model is now on exhibition in the Smithsonian Institute in Washington, D. C.

Patent Law

Patent cases, with their nice problems in mechanics and engineering, fascinated Lincoln. His reasoning, his great powers of analysis, and his ability to comprehensively grasp the subject as a whole made him effective in court when suits involving patent infringements were on the docket.

The case of Parker vs. Hoyt, an action for the infringement of a patent water wheel, came to trial in Chicago during June, 1848. Lincoln was one of the counsel for the defense, and he based his arguments on the existence of an older patent, trying to establish the want of novelty in the invention of the plaintiff. Lincoln took a deep personal interest in the case, using his earlier experience in tending a sawmill to explain to the jury the action of water on the wheel in so clear and intelligible a fashion that the jury was able to comprehend all the points and the line of defense of his side of the case.

The court, in its charge to the jury, told them that the prior patent, on which the defendant was placing his reliance was no defense at all, but in spite of this the jury returned with a verdict for Lincoln's client. Lincoln always regarded this as one of the most gratifying legal triumphs.

This power of Lincoln's to clearly demonstrate his ideas was no mere accident, and it did not depend on the power of oratory. In order to understand fully just what the phrase, "to demonstrate" meant, Lincoln, though past forty, began the study of the six books of Euclid. He carried the books with him on the Circuit and applied himself to them with vigor. He was determined to master them. Swett, who traveled the Circuit with him says, "I have seen him myself on the circuit, with a 'geometry' or an 'astronomy' . . . working out problems and propositions in moments of leisure."

Herndon says that Lincoln, after his return from Congress, was a "hard student" especially in mathematics. This was brought about by his ambition to state a conclusion so logically that the proposition would be proved with certainty.

At the December 1851 term of the United States Circuit Court, Lincoln had the case of the Columbia Insurance Company vs. Curtenius, et al. The plaintiff, represented by Lincoln and others, was suing the stockholders of the Peoria Bridge Company for damage suffered by them as insurers of a canal boat and cargo sunk when it struck a pier of the bridge in the channel of the Illinois River. The defendants pleaded that an act of the Illinois legislature authorized them to construct the bridge. Lincoln demurred on the grounds that the legislature had no right to authorize the obstruction of a navigable stream. The case turned on this point. The court finally decided that the legislature did not

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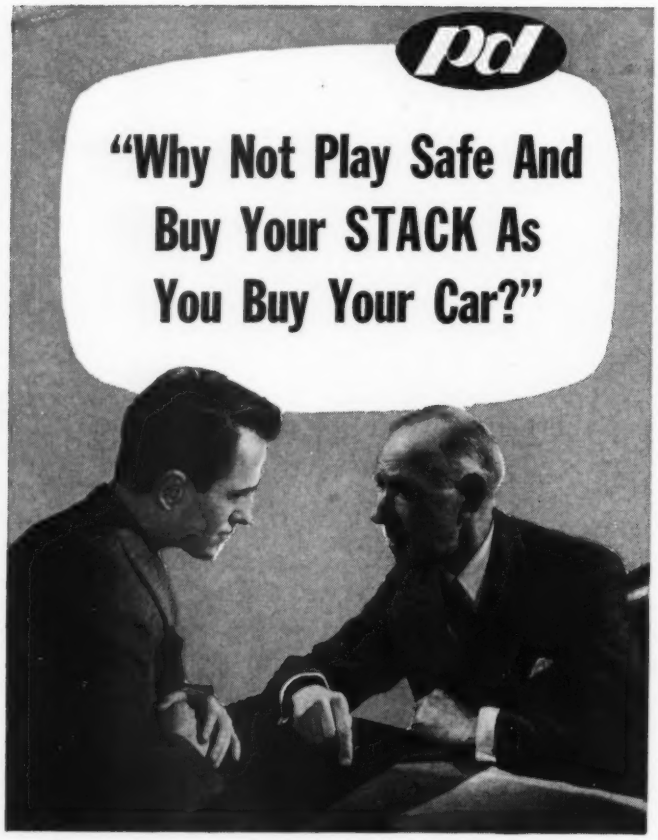

"Joe, you wouldn't buy the engine of your car from one manufacturer, the wheels from another and the body from still another, would you? Neither would I. And when I design for induced draft, I specify a P-D Stack because the I.D. Fan, though it is important, isn't the whole story. The combined breeching, stack and fan, built as ONE apparatus, gives me unit responsibility, compact design, simplified engineering, and positive performance, with a lot less purchasing details.

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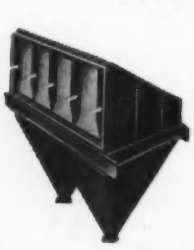

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have the right to authorize the obstruction of the river, and settlement was reached by compromise.

Lincoln's last case in the term of the Illinois Supreme Court, was in representing the defendants in the case of Edmonds vs. Meyers, et al. This was popularly known as the "Horological Cradle Case." Patent rights to this "horological cradle," a device to relieve mothers of the tedious task of cradle-rocking, intrigued Lincoln, and he took full charge of the examination of exhibits and drawings.

The scientific and mechanical turn of the case interested him. That he argued his points well may be gathered from the fact that the court's decision in his clients favor reversed the lower court's decree.

On his way back to his office in the company of a colleague, Lincoln explained the merits of the invention. His friend ventured to ask Lincoln how the thing could be stopped once it was in motion.

Lincoln replied, "There's the rub. I reckon I'll have to answer you as I did the judge who asked the same question. The thing's like some of the glib and interesting talkers you and I know; when it gets to going, it don't know when to stop."

The Scientific Approach

An interesting sidelight on Lincoln's inquiring mind, his scientific approach, is brought out by his law partner when he described the occasion he bought a copy of Well's *Annual of Scientific Discovery* and brought it into the office. Lincoln took the copy of the book that Herndon had just brought in, glanced through it reading a little, and then startled Herndon by announcing that he was going out immediately and purchase the entire set. He explained, "I have wanted such a book for years because I sometimes make experiments and have thoughts about the physical world that I do not know to be true or false. I may, by this book, correct my errors and save time and expense."

The Reaper Case

Cyrus McCormick invented the reaper sometime in the summer of 1831. He took out patents on it and the many devices that followed in the wake of his original invention. John H. Manny, of Wisconsin, 20 years later produced a similar machine for harvesting grain, and he, too, took out letters of patent on his product and began immediate production.

His machine became a serious threat to the McCormick product and, in November, 1954, McCormick brought suit against Manny. Lincoln was one of a group of distinguished counsel, including George Harding and Edwin M. Stanton, chosen by Manny to represent his interests. Lincoln immediately interested himself in the mechanical aspects of the case, and while attending the sessions of the United States Courts in Chicago, during July 1855, went to Rockford, Illinois, to study at first hand the Manny & Company reaper. He also consulted with

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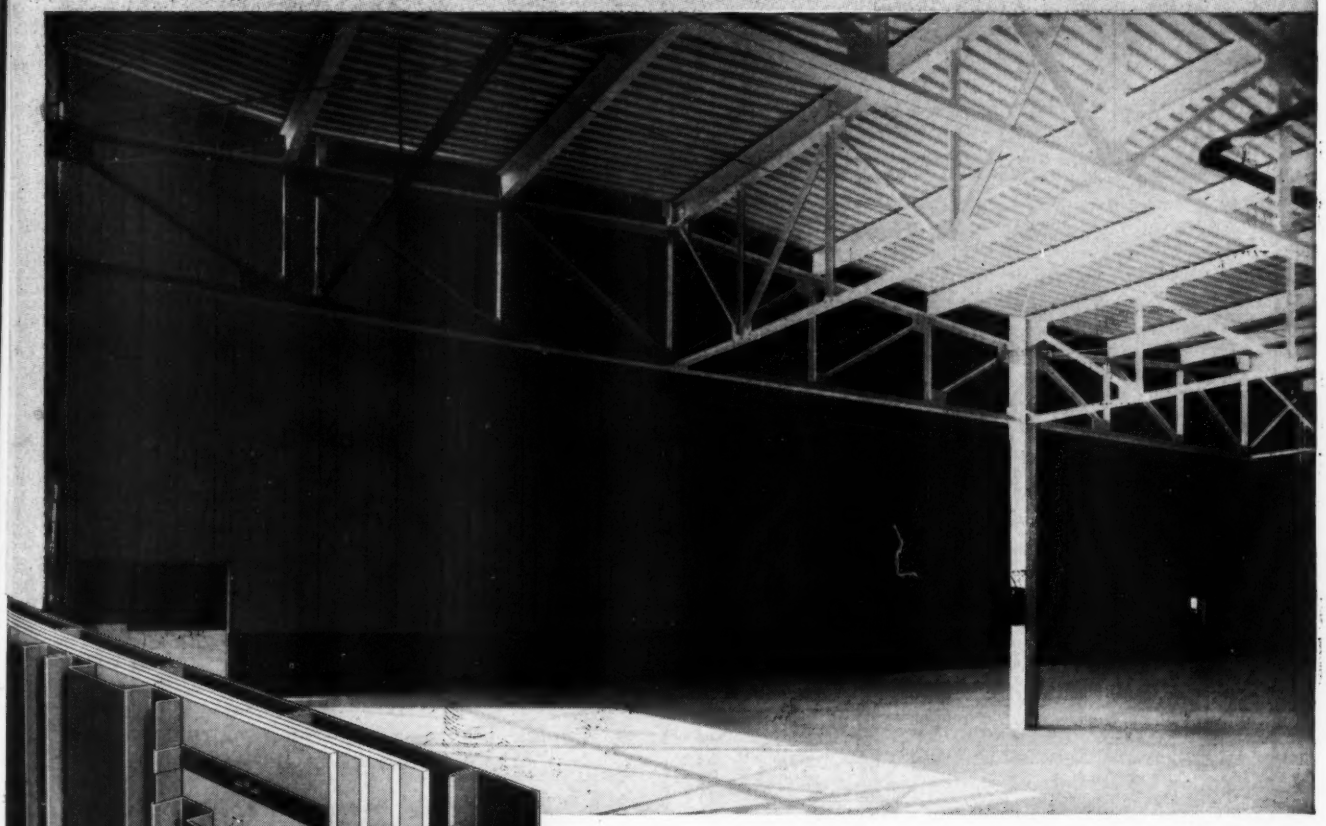

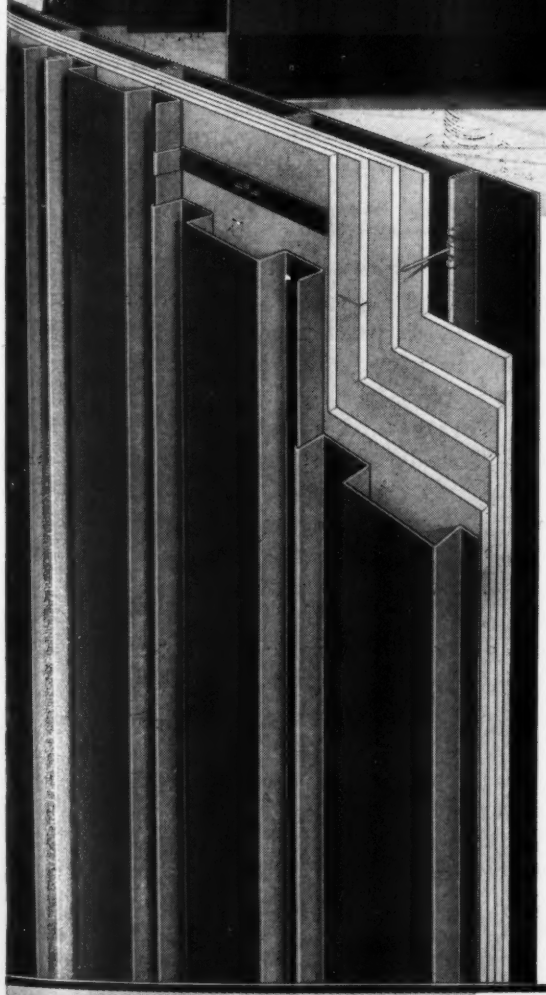

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Section of Mahon Metalclad Fire Wall showing Construction Features. Four layers of ½" Plaster Board are sandwiched between Roll-Formed Steel Wall Plates. All Joints in both Wall Plates and Plaster Board are Offset.

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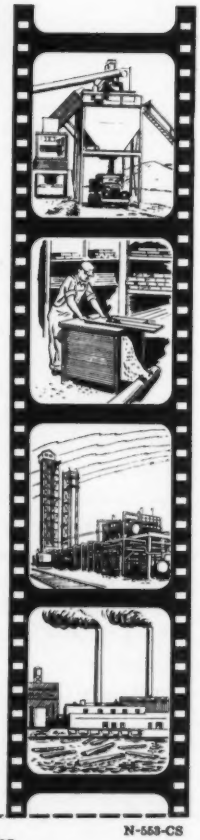

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Mr. P. H. Watson, of Washington, D. C., an outstanding figure in the patent field.

The suit opened in Cincinnati, Ohio, September 20, 1855, before Judge McLean. It was destined that Lincoln's hopes of active participation were not to be realized, for Stanton managed to force Lincoln to withdraw from direct participation in the court hearings and remain purely as a consultant.

Stanton afterward conceded that, from the knowledge he subsequently gained of Lincoln's abilities, he was undoubtedly as well fitted to handle the Manny case as were either of his distinguished colleagues. The whole affair was a very disheartening experience for Lincoln inasmuch as he had looked forward to matching himself against such opponents as Reverdy Johnson and Edward M. Dickerson, counsels for McCormick.

The Effie Afton Case

Lincoln was not, however, long denied his desire to participate in a major case involving engineering problems. The struggle between St. Louis and Chicago commercial interests had been a long and bitter one. In May, 1856, a steamboat struck one of the piers of the Rock Island Bridge and was wrecked and burned. A portion of the bridge also was destroyed. Now Lincoln was to have an opportunity to display his talents — an opportunity that had been denied him in his earlier association in the McCormick-Manny Case. This suit, Hurt et al vs. Railroad Bridge Company, was more commonly known as the "Effie Afton Case."

The case created a great deal of interest in Chicago inasmuch as it was common belief in the city that the accident was not an accident at all but a deliberately provoked incident on the part of the St. Louis Chamber of Commerce, who felt that the course of western commerce was at stake if the bridge were allowed to stand. The Chicagoans felt that the St. Louis Chamber of Commerce would go to any length to destroy the Rock Island Bridge.

The opponents of the bridge argued that the river — the great waterway for the commerce of the valley — could not be legally obstructed by a bridge and that the particular location of this bridge, with reference to the channel of the river, made it a peril to all water craft.

Mr. Norman B. Judd was the attorney for the railroad company, and he engaged Lincoln, along with others, to act as counsel. The trial commenced in Chicago, September 8, 1857, and ran through September 24, with argument and counter-argument. Plats and plans were prepared. Models were exhibited. The newspapers carried running accounts including the arguments for both sides.

Mr. Lincoln and his colleagues may have made a visit to Rock Island for a first hand study of the situation. This may be gathered from Lincoln's answer to a petitioner for him to speak at a political

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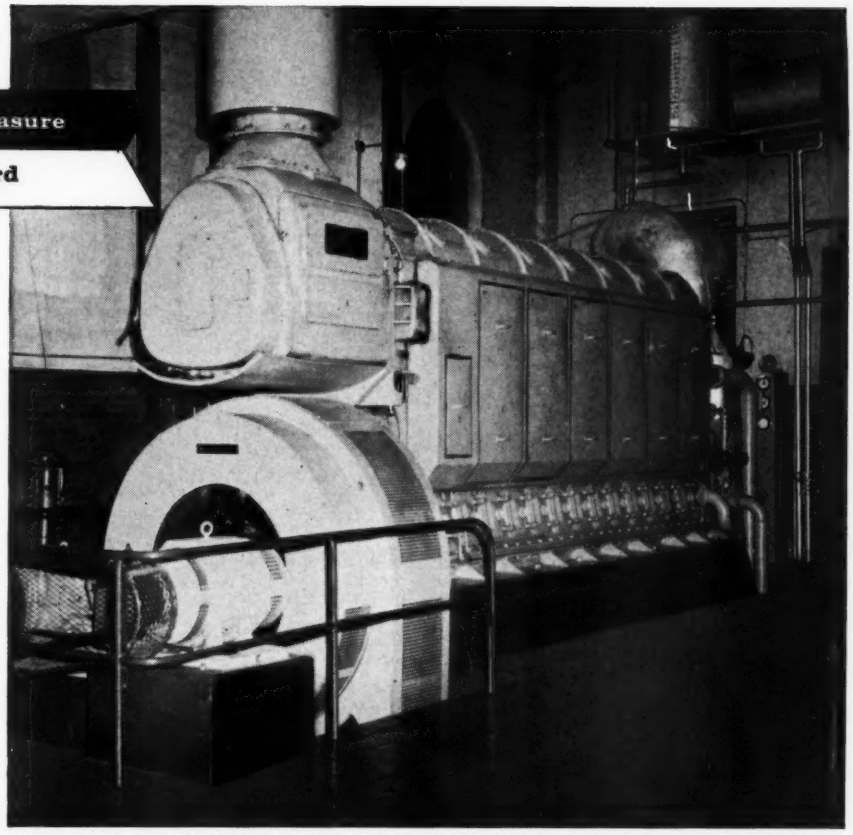

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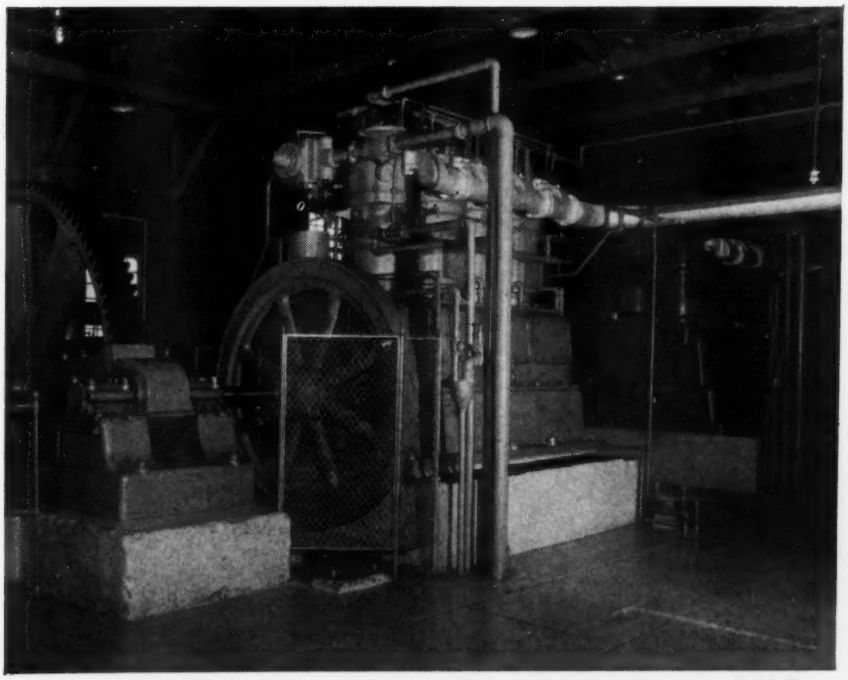

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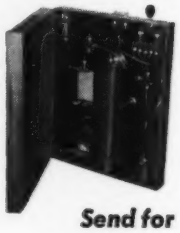

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gathering in Iowa during the time of the trial. Lincoln in his reply said, "I am engaged in a suit in the United States Court at Chicago, in which the Rock Island Bridge Company is a partner. The trial is to commence on the 8th of September and probably will last two or three weeks. During the trial it is not improbable that all hands will come over and . . . look at the bridge and, if it were possible to hit it right, I could then speak at Davenport."

In presenting his case Lincoln answered the first part of his opponent's arguments by stating that "one man has as much right to cross the river as another had to sail up or down it." In answering the second part of the argument Lincoln succeeded in showing, with a careful explanation of the current of the Mississippi River at the point where the bridge crossed, that the pilot of the craft, if he were as familiar with the river as might reasonably have been expected, could have prevented the accident from occurring.

His argument was marked by perfect candor but was full of nice mathematical calculations clearly put. Lincoln had learned what the phrase, "to demonstrate" meant.

Short Term Lecturer

A little known side of Lincoln is his short-lived career as a lecturer. In February, 1959, Lincoln was elected to honorary membership in the Phi Alpha Society of the Illinois College. Shortly thereafter he presented his first lecture, under the sponsorship of the Society, at the Congregational Church, in Jacksonville. His discourse was entitled, "Discoveries and Inventions."

It was a rather dry dissertation leaning heavily on the Bible and its allusions to the development of mankind through their intellectual advancement. He opened with, "All creation is a mine and every man a miner" — continued on through a history of the world and its creatures and ended on a note of wonderment relating to the fact that the advantageous use of steam power should be so recent a discovery in spite of the fact that the power of steam, translated into a very ingenious toy by Hero of Alexander, was known to the ancients.

Lincoln must have been encouraged, however, by the reception of his lecture for on February 21, he again delivered it at Myers Hall, in Springfield. This time he had his law partner, Herndon, in the audience as a friendly critic, and it was Herndon's opinion that Lincoln was not of the material that lecturers are made. At least Lincoln never attempted to carry on in this field.

The War Years

Lincoln's interest in things of a mechanical nature was retained by him even to the White House. The nation's need for armaments opened a new door for inventors, and Washington was overrun by men

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with new guns to be tested by the army. A clerk in the Ordnance Department tells of meeting President Lincoln in the hall of the department and receiving from him an invitation to come with him to test a new gun.

His story has a refreshingly intimate touch as he relates, "the President then pacing off a distance of about 80 or 100 feet, raised the gun to level, took quick aim, and drove a round of seven shots in quick succession, the bullets shooting all around the target like a Gatling gun. One struck near the center."

This trial did not suit the President and his companion reported that he remarked, "I can make this gun shoot better," whereupon he whittled a wooden sight which he affixed over the sight of the carbine and proceeded to do better on his next target practice.

When John Ericson approached the Senators and Congressmen with his plans for an ironclad vessel for war use he was rebuffed. He was finally able to contact President Lincoln who listened to his ideas, studied his models, encouraged him, and was most instrumental in having the Navy accept the *Monitor*. He followed the building of the craft with the deepest of interest.

President Lincoln also interested himself in the experiments then being conducted in using balloons in observation work in connection with the army. He was one of the first persons in the country to receive telegraphic messages from a balloon sent up to make observations on the enemy's works.

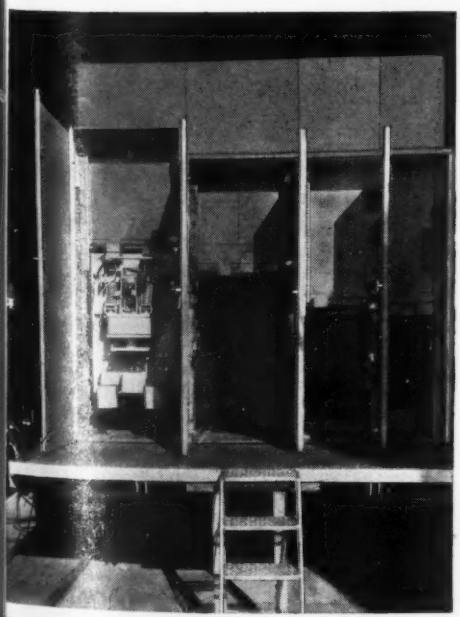
His encouragement in these endeavors brought about their full acceptance by the military establishment, and the Smithsonian Institute issued a statement that "from experiments made here for the first time it is conclusively proved that telegrams can be sent with ease between balloon and the quarters of the commanding officer."

In his Annual Message in December, 1863, President Lincoln urged upon Congress the consideration of an international telegraph across the Atlantic Ocean. He referred to arrangements that had been made by the government with the Czar of Russia for the construction of a telegraph line from the Pacific Coast through the Czar's territory to connect with the European systems. He was in close contact with Cyrus W. Field, who was the chief exponent of the trans-Atlantic cable.

The Engineering Mind

It is clear that Lincoln was much more interested in science and its application than most of us realize. Many know that he did some surveying, but few have heard of his inventions and his work in patent law. While we cannot claim that he was an engineer, he was interested in applied science and its advancement, and there is every reason to believed that he had the engineering mind. ▲▲

A test bay at the Switchgear Development Laboratory is the scene of periodic quality-control testing of production-line Magne-blast breakers in standard enclosures. Design changes are also tested here under operating conditions.



Standard metal-clad housings enable G-E engineers to test breakers under field conditions. The housing accommodates the full line of Magne-blast breaker ratings.

TESTING...

under actual - - **not simulated** - - conditions

Circuit breakers for metal-clad switchgear *can* be tested outside their enclosures, but performance may differ considerably when the unit is installed in its metal-clad housing. That's why General Electric engineers have devised a method which permits testing with the Magne-blast breaker *actually installed* in a metal-clad housing.

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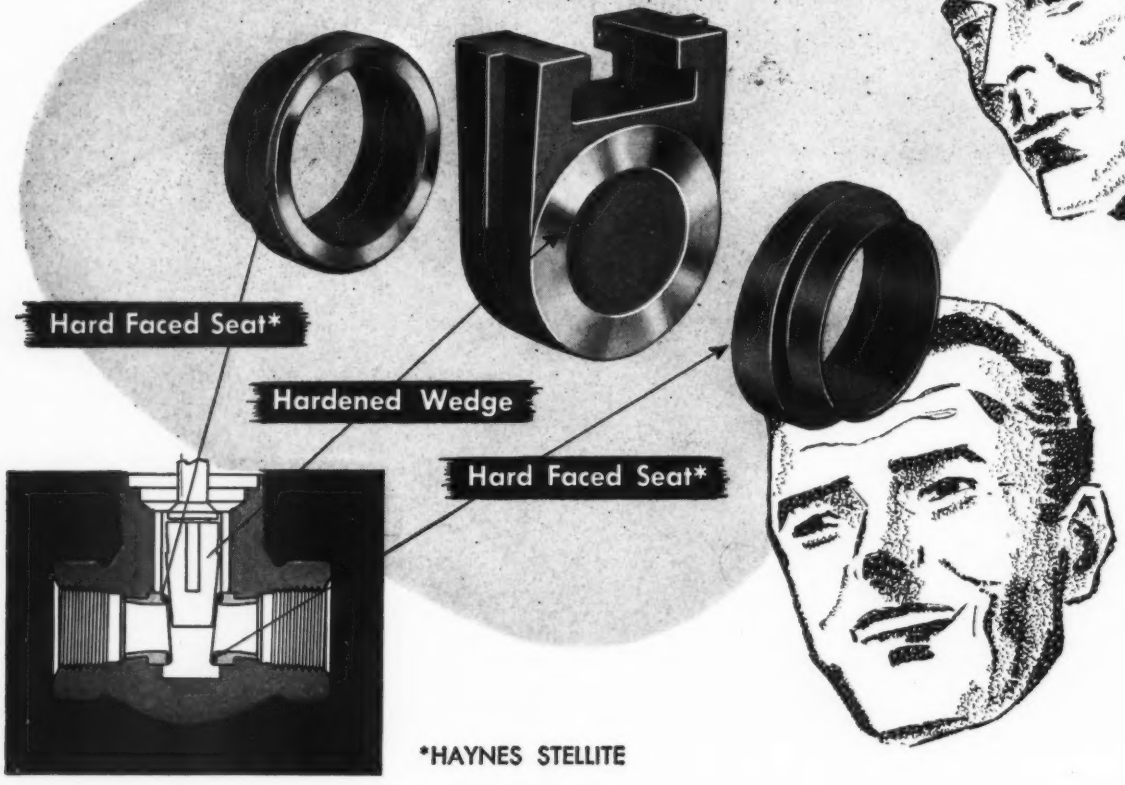

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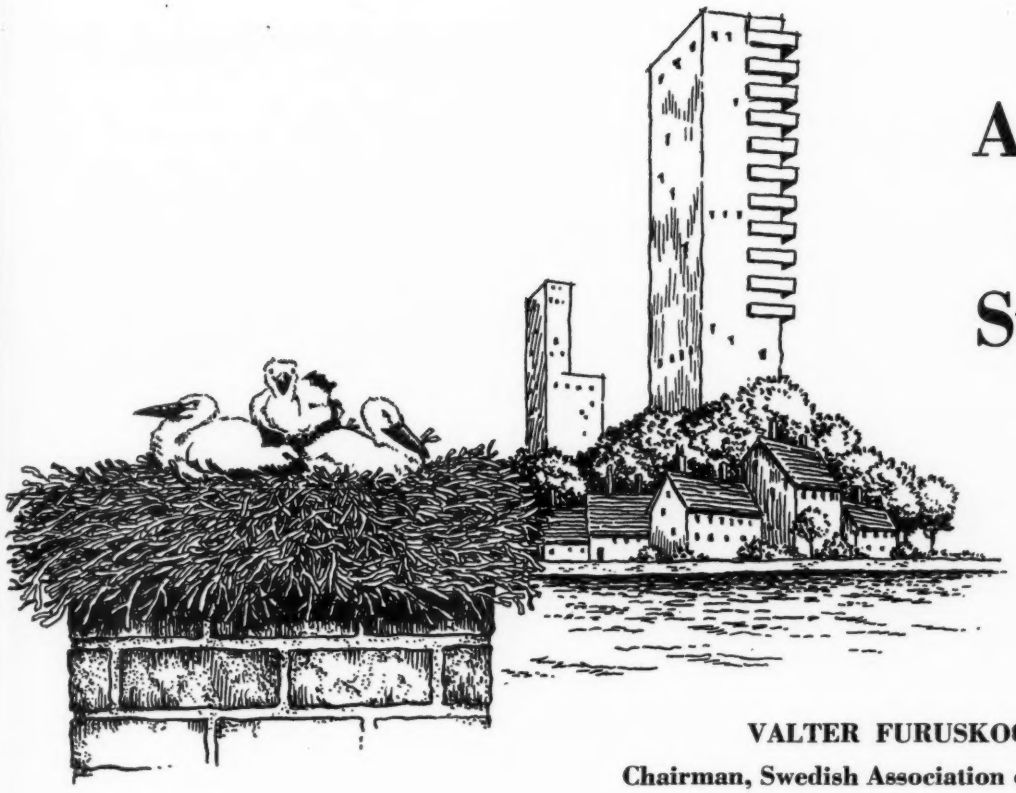


A Reply from Sweden

VALTER FURUSKOG, M.A.S.C.E.
Chairman, Swedish Association of Consulting Engineers

THE "REPORT FROM SWEDEN" in the July issue of CONSULTING ENGINEER has given rise to some discussion here. It gives, on the whole, a fairly good picture of the present situation as regards the consulting engineering profession in Sweden. Since, however, some statements in the report may give a misleading impression of the status and standing of our consulting engineers and their national organization, I would like to make these comments.

According to the statutes of the Swedish Association of Consulting Engineers, founded in 1910, the members of the Association shall be Swedish subjects with an approved theoretical education (graduation from one of the two technical universities or a corresponding education) and with at least 10 years engineering practice after graduation, 5 years of which must be in a responsible position in a consulting engineering firm. They shall, further, devote themselves to independent practice of the consulting engineering profession as their main occupation.

COMPARISON OF EUROPEAN ASSOCIATIONS

Association	*Population millions*	*Number of Members*	*Thousands of Inhabitants per Member*
Belgium	8.8	90	98
Denmark	4.4	130	34
Finland	4.1	25	16
France	42.9	674	64
Germany	49.0	750	65
Great Britain	50.9	403	127
Holland	10.5	75	140
Norway	3.4	110	31
Sweden	7.2	92	78
Switzerland	4.9	40	122
	Total 186.1	2389	Average 78

Membership Requirements

On joining the Association the member pledges . . .

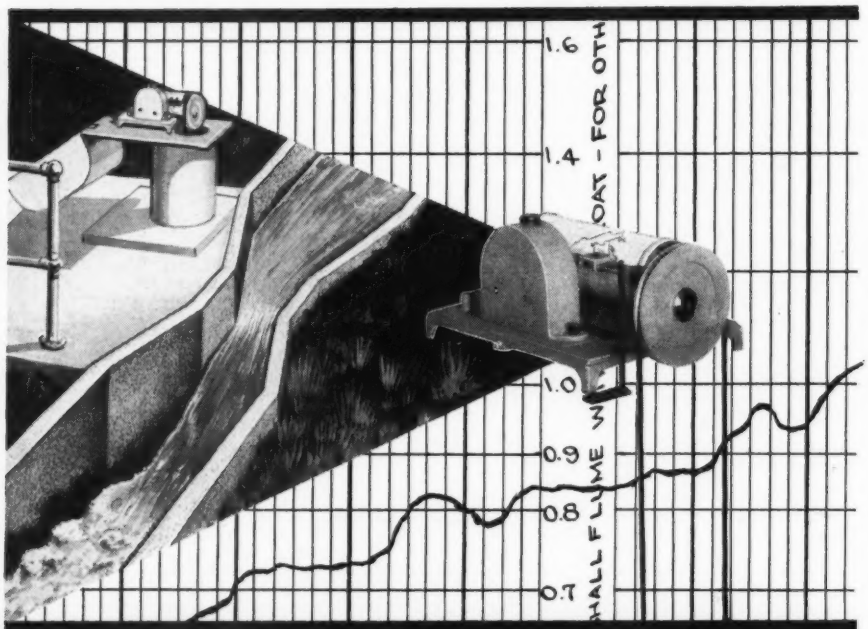
¶ To disclose, in the event of the member having a financial interest of any kind (including any private economic arrangements with contractors or manufacturers) which may affect projects or reports prepared by the member, this fact in writing to the client and to the Council of the Association;

¶ To notify the Council, before the end of February each year, concerning any Swedish patents, within the field of his consulting work, he may possess or have sold against licenses;

¶ Not to be a selling agent for, or a shareholder in, any industrial enterprise or contracting or manufacturing firm, nor to practice any profession dependent upon employment in such firms, in the event of these being related to the branch, or branches, within which the member is practicing his consulting profession, unless the Council finds reasons, in specific cases, to make an exception.

A practical consequence of these pledges is that on joining the Association the member supplies to the

NOW Low-Cost Automatic Flow Recording



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For Measuring Sewage, Industrial Waste and Other Flows

Flow charts directly readable in million gallons per day or gallons per minute over various sizes of Parshall flumes. The same recorder can also be used with charts reading in feet and hundredths to record head or surface fluctuations in lakes, streams and wells. Priced from $132. Write for free Bulletin 24.

The planning and efficient operation of any project which involves measurement of flowing liquids is based on flow data which can be obtained with STEVENS Water Level Recorders. STEVENS instruments are at work compiling data on hydro-electric and flood control projects and in water works, sewage disposal plants, irrigation and industrial installations in all parts of the world.

Experienced technical staff available for consultation on any liquid measurement installation. Write, giving description of project, and scope of data desired.

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Council a promissory note for 25,000 Swedish kronor ($5000) which can be exacted from him, should he fail to observe the rules and should he not submit to correction within the six weeks' notice given by the Council to that effect.

No Bond Forfeited

Evidently, the mere existence of this bond will have no direct economic consequences to a consulting engineer who practices his profession in strict adherence to these rules. This also is confirmed by the fact that during the 47 years which have elapsed since the foundation of the Association, no accusations of breach of the rules have been made against a member. On the other hand, the bond is considered to form a guarantee to the integrity of the professional man, to the benefit of his client, and the reputation of the consulting engineering profession in general.

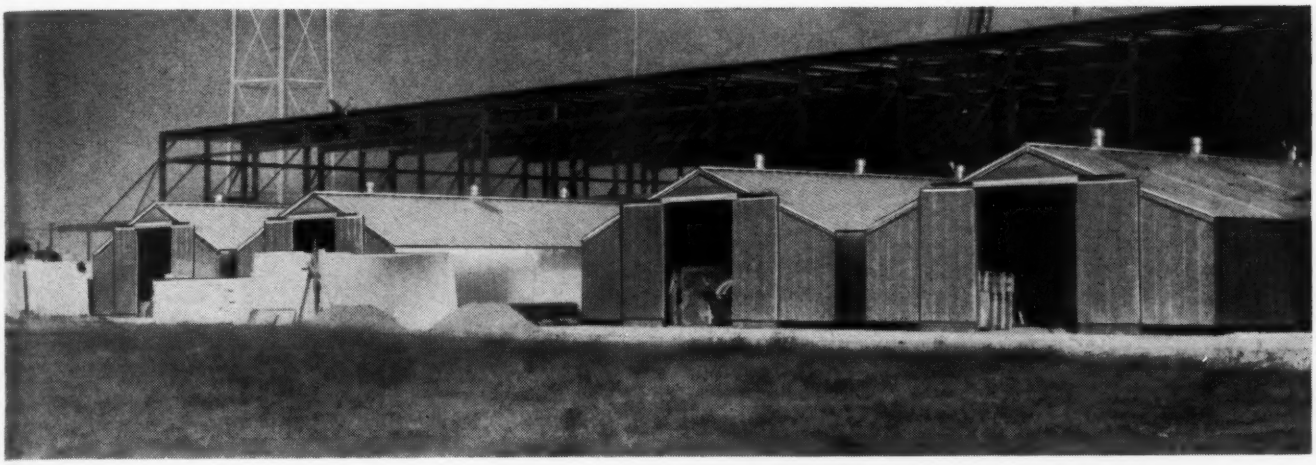
It follows that the magnitude of the bond itself will come into consideration only upon violation of the statutes, and it should not, as intimated in your "Report," prevent any consulting engineer who intends to respect the rules of professional conduct set out in the statutes from joining the Association. Unwillingness to join the Association for this reason rather would indicate fear of losing the bond money, and since this only can happen when the rules are broken, the real reason for unwillingness to join would be the severity of the rules, not the bond.

Engineers vs Population

At present the Swedish Association has 108 members. Sweden has a population of 7.3 millions, so there are about 68,000 inhabitants per member. The corresponding figures for 1955 for all the European associations affiliated with the International Federation of Consulting Engineers (FIDIC) are listed in the table.

As will be seen from the table, the Swedish association repre-

How a Contractor and a Manufacturer Saved Money with an Armco Steel Building



Four Armco Steel Utility Buildings, in foreground, provide shelter for textile machinery while the new Carlisle Finishing Company plant is being completed. Later, they were dismantled and moved to other cities for re-erection on permanent sites.

Consulting Engineer:
J. E. Sirrine Company,
Greenville, South Carolina

When Carlisle Finishing Company, Carlisle, South Carolina, drew up plans for a new plant, the company and the building contractor made a novel agreement that saved money for both of them!

The contractor, Daniel Construction Company, Inc., of Greenville, South Carolina, put up an economical 70- x 140-foot Armco Steel Building for their use during construction of the main plant. After construction work was completed, the Armco Building was turned over to Carlisle, a division of Cone Mills Corporation, textile manufacturers of Greensboro, North Carolina. Now it's a permanent warehouse.

On the same project, company officials had the problem of storing textile machinery arriving before the plant was completed. As a solution, they erected four Armco Utility Buildings, each 36 by 48 feet, adjacent to the site for this purpose. After the new plant was completed, two of the buildings were dismantled, moved about 150 miles to Greensboro, North Carolina, and re-erected at the owner's White Oak Plant. The other two buildings were also dismantled and sent to the Greenville, South Carolina, plant to be used for storage.

In each case, an Armco Building provided shelter at the construction site and was later used as a permanent structure for another purpose.

* * *

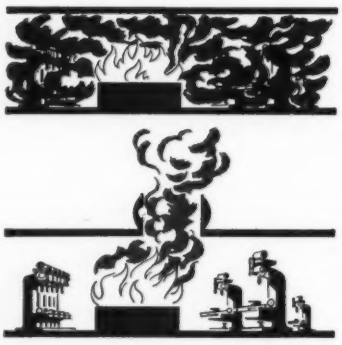
Armco Buildings, with their all-bolted construction that simplifies erection or re-erection, are one of the more than 30 Armco Drainage and Construction Products for industrial, municipal, highway and railway applications. Write for data or *call Western Union and ask for Operator 25.* Armco Drainage & Metal Products, Inc., 5667 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.

This Armco Steel Building was purchased by the Carlisle Finishing Company to serve as shop, office and equipment storage for the contractor. According to plan, it was later used as a warehouse by the owner.

These Armco Utility Buildings are shown here after being dismantled, moved 150 miles, and re-erected at another of the owner's plants.

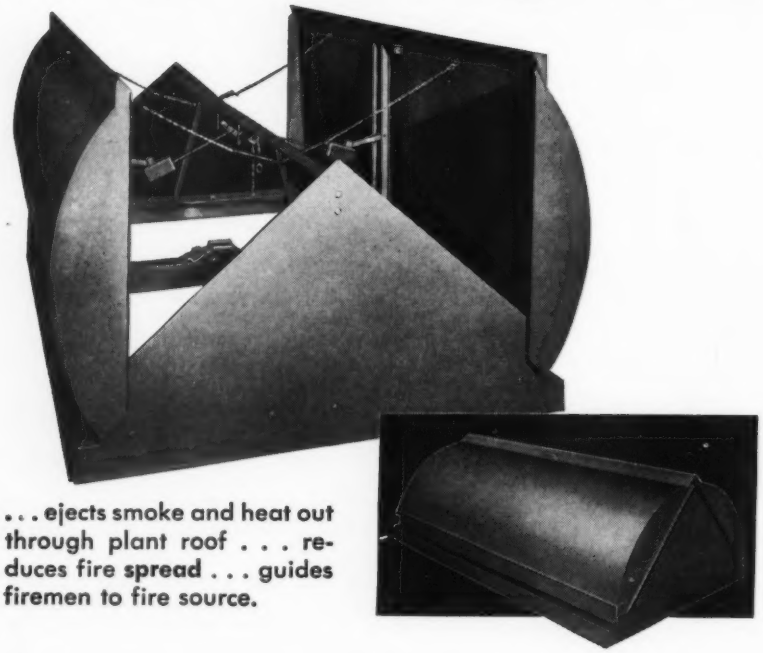
Armco Construction Products

Keep your fire loss Down



with the efficient new

Swartwout Pyrojector



. . . ejects smoke and heat out through plant roof . . . reduces fire spread . . . guides firemen to fire source.

Pyrojector is an effective answer to fires that billow up and spread under closed roofs. It opens a 28 square foot draft-fed escape vent for smoke and flames. Heat at 212° F. melts a fusible link — releases powerful spring force that opens dampers instantly.

This is a completely new design, with unusual features. Low contour (only 29" above curb), neat appearance. Installs and operates *entirely above roof level.* Spot it over most likely fire sources, singly or in groups. Or alternate with roof ventilators. Weatherproof when closed. Can be opened for extra ventilation in dry weather. Dampers are double wall construction, insulated. Release mechanism is rugged, positive.

For complete details of this new "escape" ventilation unit, write today for Form 701-P.

The Swartwout Company, 18511 Euclid Ave., Cleveland 12, Ohio

Swartwout ROOF VENTILATORS AND VENTILATING LOUVERS

ALSO AUTRONIC PROCESS CONTROL EQUIPMENT

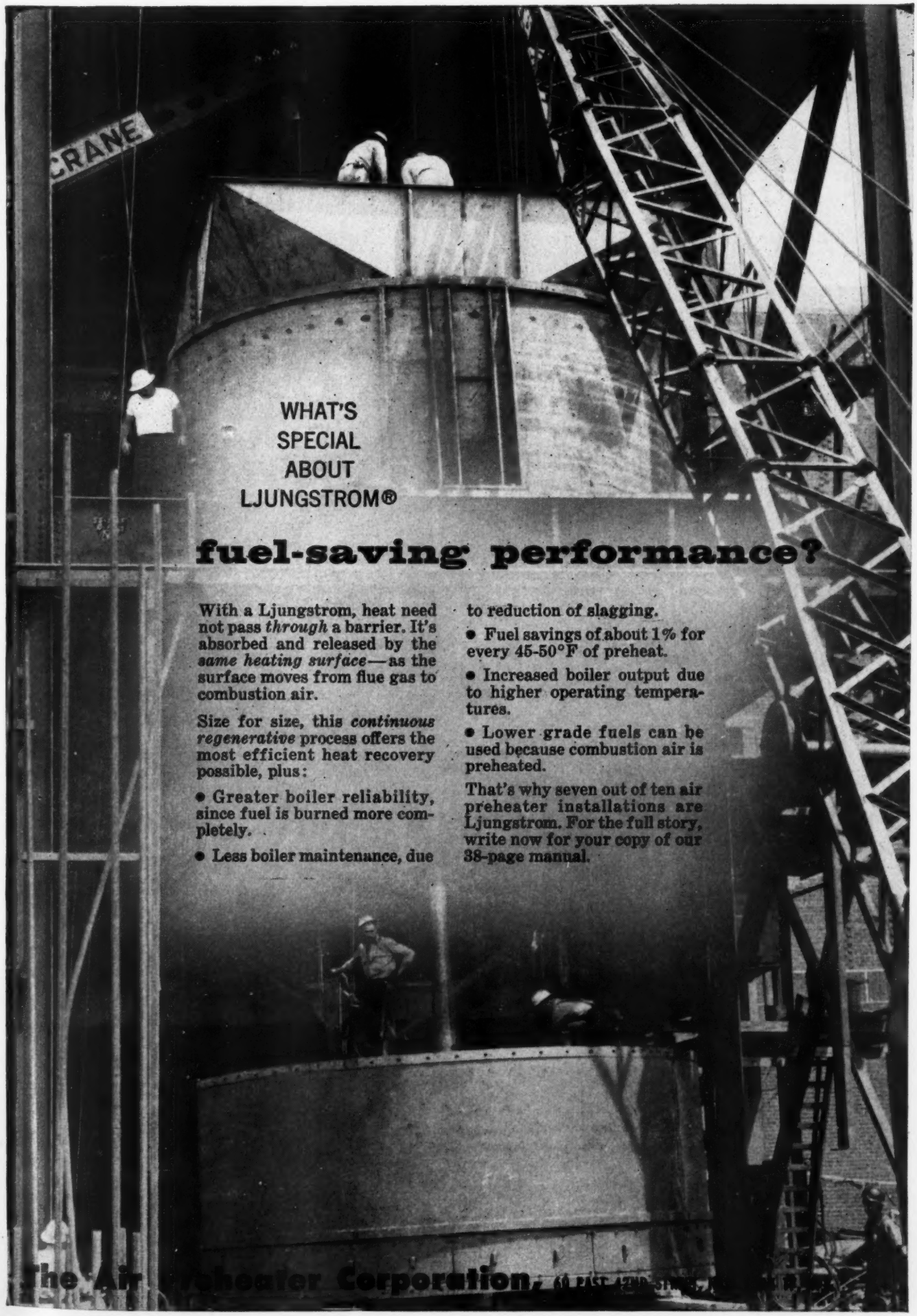
sents about the average, though we may be somewhat on the low side in view of the fact that the country is highly industrialized. It should be noted, however, that we would need only 230 members to match the low figure shown in the right hand column for Norway (31), yet the number of university graduated men practicing the consulting engineering profession in this country may be as high as 700 — part-time consultants of the type mentioned in your "Report" not being counted.

Some Other Reason

The annual contributions to be paid by each member to the Association are inconsiderable, and they are spent mainly on the publication and distribution of about 60,000 copies of the *List of Members.* The reason for the difference between the total number of men practicing in the consulting engineering field and the number of members of the Association can hardly be the cost of the membership. The reason must be sought elsewhere.

The Will to Join

With the general trend of the modern community towards organization of individuals with interest in common into groups to represent them, it seems plausible that an association of consulting engineers with reasonably low member's fees but without particular claims on the professional conduct of the members soon would become popular and absorb nearly all engineers in private practice. In particular it seems those of the lowest standard and standing would join, since they would benefit most from such an association. With increasing demands on the members, regarding age and experience, independence, and integrity, the number of eligible members would, of course, gradually decrease. The remainder would form a more or less selected group consisting of those filling the requirements of statutes as rigorous as could rea-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fuel-saving performance?
With a Ljungstrom, heat need not pass *through* a barrier. It's absorbed and released by the *same heating surface*—as the surface moves from flue gas to combustion air.
Size for size, this *continuous regenerative* process offers the most efficient heat recovery possible, plus:
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That's why seven out of ten air preheater installations are Ljungstrom. For the full story, write now for your copy of our 38-page manual.
The Air Preheater Corporation,

Installation of 18" Pratt High Pressure Rubber Seat Butterfly Valve in prestressed concrete water main, Mansfield, Ohio. Engineers: Shaffer, Parrett and Associates.

MANSFIELD...Pratt Butterfly Valves meet all specs for distribution service

The real test of a distribution valve is its ability to operate when needed. Valves in water distribution service are primarily emergency measures, normally left either open or closed for months, or even years. Yet, they must operate when needed, often to prevent serious property damage in the event of a broken water main.

Mansfield engineers chose Pratt High Pressure Rubber Seat Butterfly Valves for this rigorous duty because Pratt valves meet all specifications for distribution service. The critical disc edge is a corrosion-resistant material, seating against a heavy, mechanically retained rubber liner to provide **permanent, drop-tight shutoff.** The stainless steel valve shaft rotates in bronze bearings, self-lubricated for life, and the valve operator is permanently lubricated and sealed. These features are your assurance of easy operation when you need it... features that are built into Pratt valves with the experience that comes with 30 years of leadership in butterfly valve design. Specifying Pratt valves puts this experience to work for you.

NEW! Latest, most accurate pressure drop and flow data, conversion tables, discussion of butterfly valve theory and application plus other technical information.

Write for Manual B-2.

HENRY PRATT — RUBBER SEAT Butterfly Valves

Henry Pratt Company, 2222 S. Halsted St., Chicago 8, Ill. Representatives in principal cities

sonably be instituted for the consulting engineering profession.

The Right Ratio

Since the figures in the right hand column of the table (for different nations with about the same demands on professional conduct) are not very widely scattered, it seems reasonable to assume that in a highly developed European country there should be, on an average, about 13 highly qualified consulting engineers per million inhabitants, but that this number might vary between 7 and 30, depending on local conditions, educational facilities, technical development, possibilities of obtaining work abroad, and other factors. It is, however, to be expected that these figures will increase considerably during the next decades in view of the increasing demand for technical advice all over the world.

The Sundowners

The "Report from Sweden" deals to some extent with a "part-time consultant" called Sten Lindberg, who according to the "Report" represents a category of Swedish consulting engineers receiving perhaps 5 to 10 percent of the total amount spent for consulting services. Mr. Lindberg, who is a civil engineer, holds a government position and supplements his salary by doing private homework for whoever cares to ask for his services. Because of his official position he is able to establish business connections with private or semiprivate clients and with colleagues in other official departments. He considers himself to be better prepared to take on rush jobs than the larger consulting engineering firms, has the time to follow every detail of the jobs, and can devote more personal attention to them than can the larger firms. For his fees he applies the rates of the Association to which he and we, his colleagues in private practice, belong.

Yes, we know that type of consulting engineer. He is supposed

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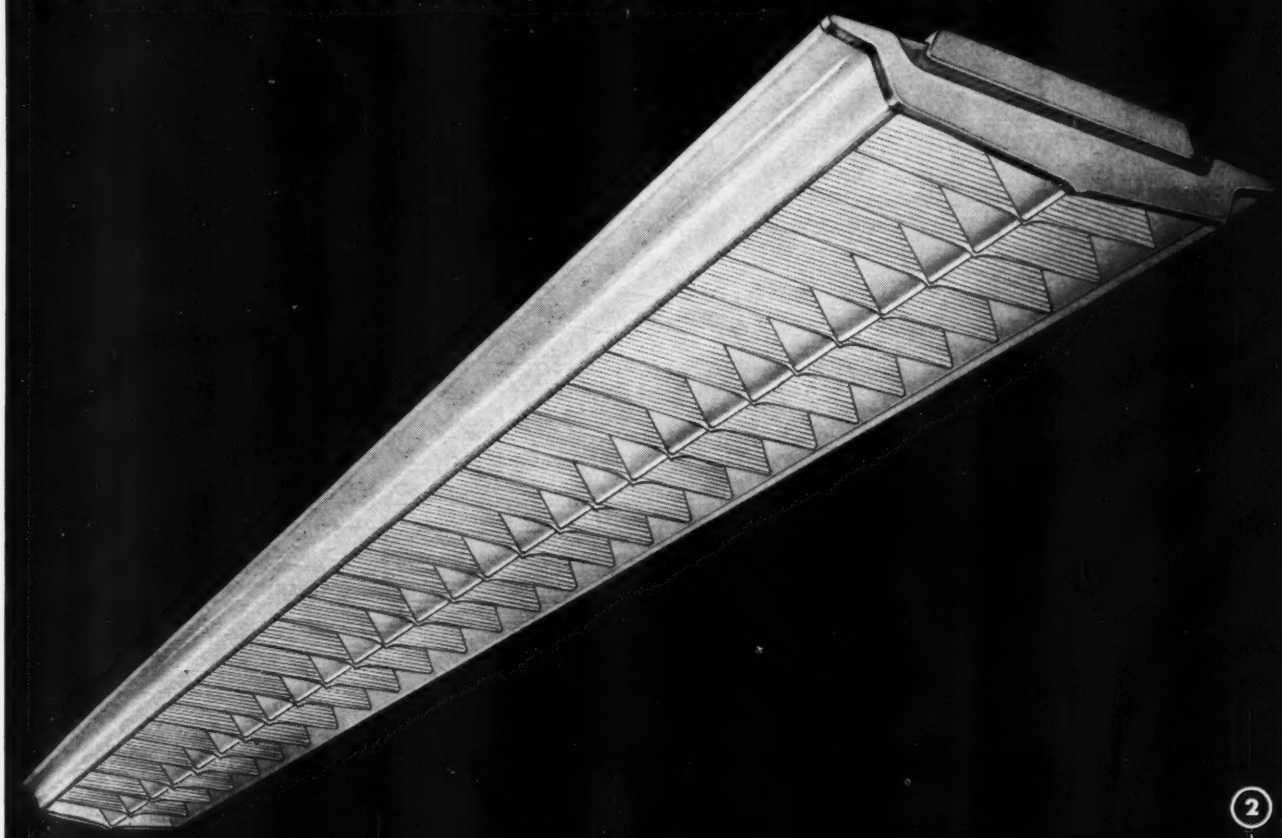
PARAWING-2® ULTRA

WITH PARALOUVER LOUVERS



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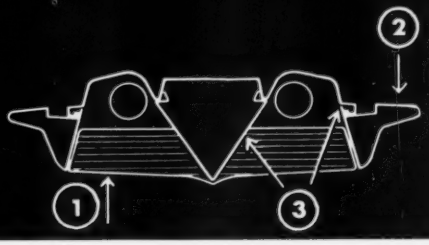
CONTROLS BRIGHTNESS MORE EFFECTIVELY

—EVEN IN THE "GLARE ZONE"



- For schools, offices, stores, wherever you need a shallow fixture
- Apparent depth only 2½ inches
- 4-foot and 8-foot units or sections
- For Rapid-Start and Slimline lamps

1. Aluminum Paralouvers® have a surface of parabolic segments that direct light to the working plane.

2. Box-wing plastic side diffusers provide gradations of tone that blend into ceiling . . . are completely sealed against dirt, stay cleaner longer.

3. Center louver, top plates and inner wall combine to form efficient *Parabolic Profile* design.

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Full dust collecting capacity always available from

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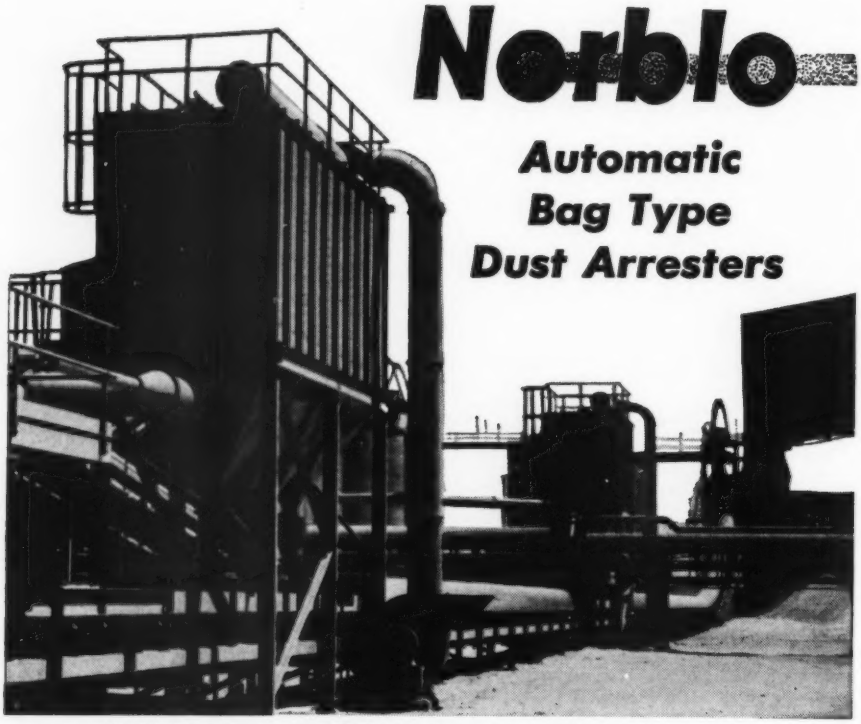
Automatic Bag Type Dust Arresters

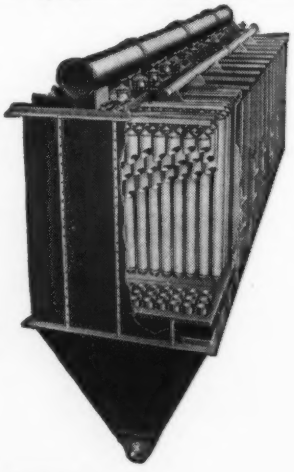


Norblo Dust Arresters at California Cement Corp. plant at Mojave, Cal.

Twenty-four hours a day is a gruelling grind, but Norblo equipment takes it. What's important to plant owners and operating staff is that full dust collecting efficiency holds level during the day and night punishment.

Norblo installations include a group of basic compartment units, each housing 78 cylindrical bags. Variable cyclic cleaning involves one compartment at a time, and that for only a few seconds. Engineered to the needs of each installation, there's ample capacity without waste, but without undue strain on the equipment. Easy maintenance is provided for.

Users of Norblo Equipment in cement plants, industrial plants of many types, and mining and smelting agree that complete satisfaction is assured when you install Norblo. Write for information—state your dust collection problem.



Norblo also builds centrifugal and hydraulic dust collectors, exhaust fans, cement air cooling systems, and portable type dust collectors.

The Northern Blower Company

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Norblo ENGINEERED DUST COLLECTION SYSTEMS FOR ALL INDUSTRIES

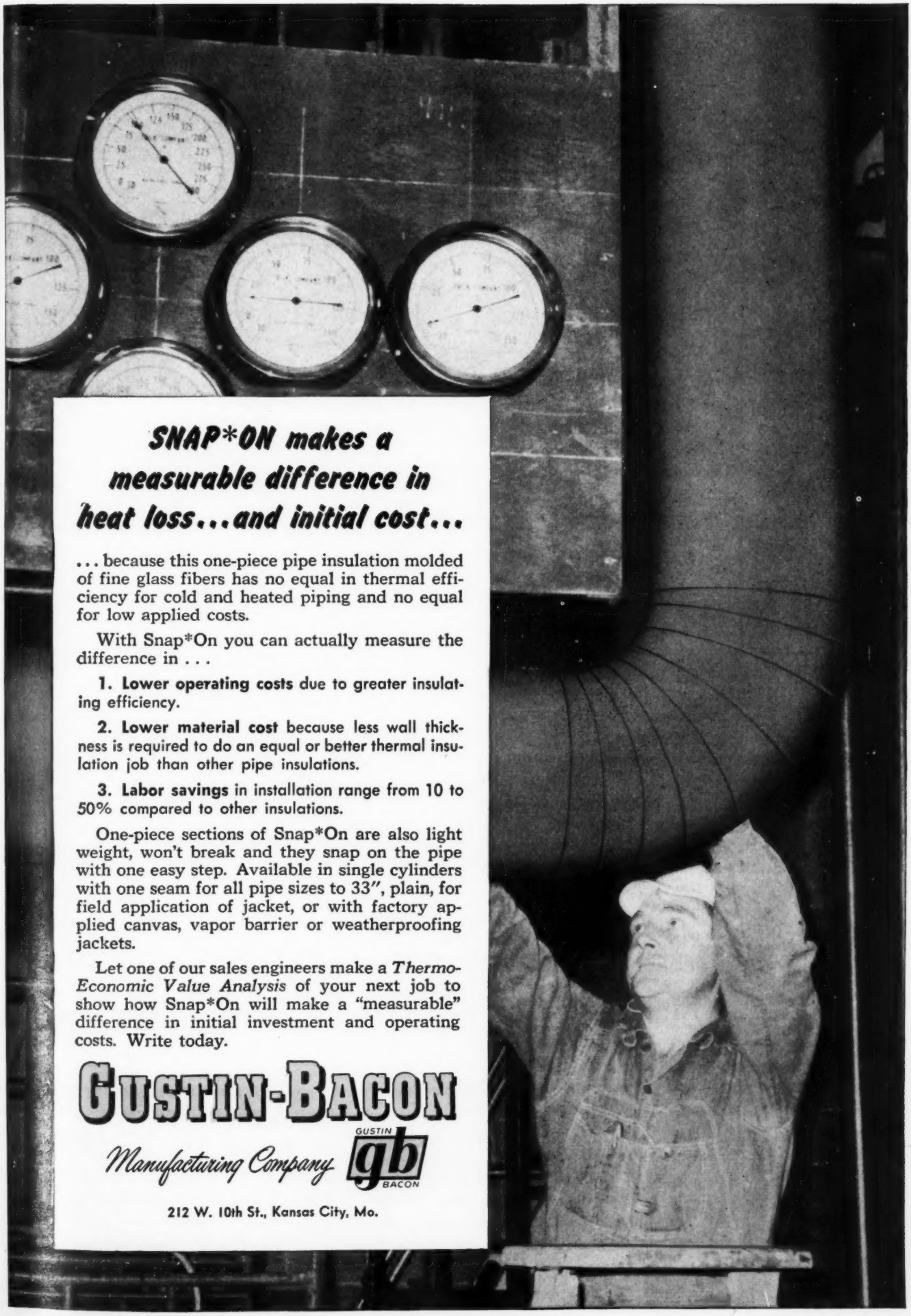
to devote himself whole-heartedly to his job as a government official, but he has energy enough to earn an additional 25 percent of his official salary working after office hours, and he is always prepared to take on rush jobs. He has a good pension guaranteed by the taxpayers; he has free use of his office in the day-time; and he uses his home as an office at night. He has no expenses for client contacts, overhead, instruments, office material, or study tours. He may be able to obtain easily and at low cost assistance with typing and tracing from those subordinates in his office who also may want to supplement their salaries — and nevertheless he charges a normal fee for his services.

Bad Competitor

No doubt, a man in Mr. Lindberg's position can under these conditions devote personal attention even to the smallest details in his private job and still have a good revenue from his homework. He is, however, a bad type of competitor to those of his fellow workers who are entirely dependent upon the fees they can receive for their professional services as consulting engineers, and he should, we think, not be mentioned in your magazine as a representative example of this honorable profession.

Only Tolerated

As may be gathered from the above the part-time consultants are as little accepted by the regular engineering offices in Sweden as in the United States. Your skeptical editorial notes under the heading "Swedish Night Life" are thus well justified. With the present abundance of work and shortage of engineers, the "Sundowners" may have to be tolerated to a certain extent. However, we think their activities should be checked more closely by their employers since too much night and holiday work no doubt will affect their ability to perform their normal duties during the day. ▲▲



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... because this one-piece pipe insulation molded of fine glass fibers has no equal in thermal efficiency for cold and heated piping and no equal for low applied costs.

With Snap*On you can actually measure the difference in . . .

1. **Lower operating costs** due to greater insulating efficiency.

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One-piece sections of Snap*On are also light weight, won't break and they snap on the pipe with one easy step. Available in single cylinders with one seam for all pipe sizes to 33", plain, for field application of jacket, or with factory applied canvas, vapor barrier or weatherproofing jackets.

Let one of our sales engineers make a *Thermo-Economic Value Analysis* of your next job to show how Snap*On will make a "measurable" difference in initial investment and operating costs. Write today.

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212 W. 10th St., Kansas City, Mo.

The new Asphalt constructed Route 128, near Boston, replaces the old route built 25 years ago. The highway consists of two roadways each of which has three 13' lanes and a 10' shoulder. Roadways are separated by a depressed grassed median varying from 30' to ¼ of a mile. The pavement consists of 12" well-compacted gravel sub-base, 4½" penetration macadam base, 1¼" Asphaltic concrete binder course and a 1¼" Asphaltic concrete surface course.

Old road that gave traffic "the creep

...built with high economy...for low maintenance.

Outmoded road conditions slowed traffic to a creep on the old Route 128, in Massachusetts.

So a new, wider Route 128 was recently completed ... for today's and *tomorrow's traffic*. With greater capacities ... better layout, grades and crossing eliminations.

It's a smooth-driving, long-lasting Asphaltic concrete highway. Built at low cost. To make cars and trucks glide along, safely. And to be easy on taxes ... for generations to come.

Modern heavy-duty Asphalt construction has proved to be ideal for highways and primary roads in every section of the country. It allows unusual design versatility ... speed and ease of construction.

Asphalt pavement is resilient, rugged, skid-resistant. Glare-absorbent. It seals out damaging moisture ... is not affected by de-icing salts that usually damage other pavement. Snow and ice melt faster, too. The way ahead is clear, quicker.

In the face of rising construction costs you can keep within budgets by paving with Asphalt.

You'll keep costs down ... keep performance high ... keep taxpayers happier ... when you design for modern Asphalt construction.

ep**replaced with wide, durable Asphalt Highway**

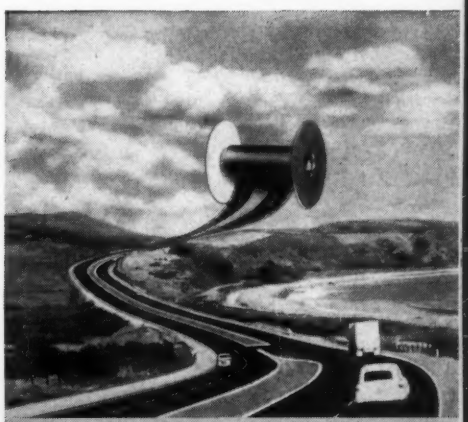
ce and low future taxes

PREFERS Asphalt Construction

One of the companies that played a leading role in the building of the new Route 128 is the M. De Matteo Construction Company, Quincy, Mass.

The Superintendent of this company, engineer Roland S. Delaware, writes, "I have worked with Asphaltic pavements since 1931, and have always advocated the use of Asphalt in preference to other types of pavement. I like it from an engineering standpoint... and enjoy the riding qualities and speed of construction."

THE ASPHALT INSTITUTE
Asphalt Institute Building
College Park, Maryland



Ribbons of velvet smoothness . . .
MODERN **ASPHALT** HIGHWAYS

Report From The East Coast

STAFF

Like many groups that agree to overcome their problems after they organize, the Engineers and Scientists of America, and engineers' union, has been overcome by its problems.

When the ESA was organized in 1952, the membership was split over whether to limit the organization to engineers or to include allied technical groups. "We hoped that future growth would make this merely an academic question," Joseph Amann, ESA president, added. "It didn't happen. Instead, time just made the problem worse. And, unfortunately, the question became an emotional one."

The showdown came last May at a convention in Los Angeles. More than the necessary two-thirds of the ESA board voted to change the bylaws and constitution to limit the membership to professionals.

Prior to the convention, a membership drive had backfired, costing the ESA about 15,000 members. The Engineers and Architects Association, a West Coast group with about 15,000 members, refused to pay a $1 per member special assessment for the organization fund. As a result EAA was expelled.

Just before the convention the EAA tried to pay the assessment and arrange to be reinstated. This could not be done under the constitution and bylaws, the Westerners were told. The EAA were asked to make a new application to the executive board for membership. This the West Coast group refused to do. However, the EAA knew that the application would be a waste of time, for EAA membership includes engineers, draftsmen, and other "allied technicians."

At present, the once comparatively powerful Engineers and Scientists of America estimates its membership at 25,000. The Engineers and Scientists Guild, now in the formation stage, estimates its followers at almost 20,000. Both organizations have future plans to organize the employees of consulting engineers, as soon as this is possible.

Amann, presiding in what the Engineers and Scientists Guild literature describes as a "plush office," in Washington, said his organization, the Engineers and Scientists of America, is far from dead. "On the other hand, the ESG can't succeed because professionals have problems and aspirations that are not shared by technicians. The mixing of the two creates a serious administrative problem. Professional development, professional status, and remuneration, are all considerations on which the two differ.

"A mixed group tends to become more and more technically minded because the technicians are the ones who take the most active interest in a union. Possibly, in the future, the technicians would outnumber the engineers in a so-called engineers' union if the two groups were combined. I think this could happen because of the number of technicians it takes to support an engineer."

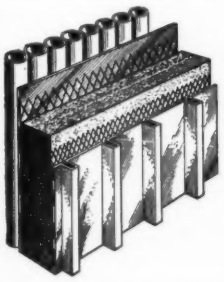
Amann pointed out that the ESG is not even an organization yet. The bulk of its membership is on the West Coast and on the East Coast, with very little in between.

The ESA president added that "ESG can't maintain a national organization consisting of two groups separated by 3000 miles. The old Engineers and Architects Association politics also will enter into the ESG downfall. Setting up a national organization is outside their [ESG] ability."

As to the old argument that belonging to a union damages the professional status of an engineer, Amann said, "there is no difference in an individual and a group asking for a raise. We merely maintain that a group of professional people can bargain better."

What are the ESA plans in regards to organizing the employees of consulting engineers?

Amann said they would love to, but a limited budget prevents any aggressive action on the part

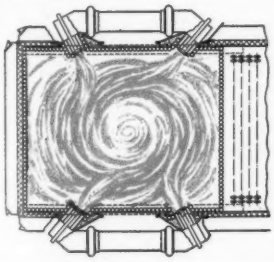


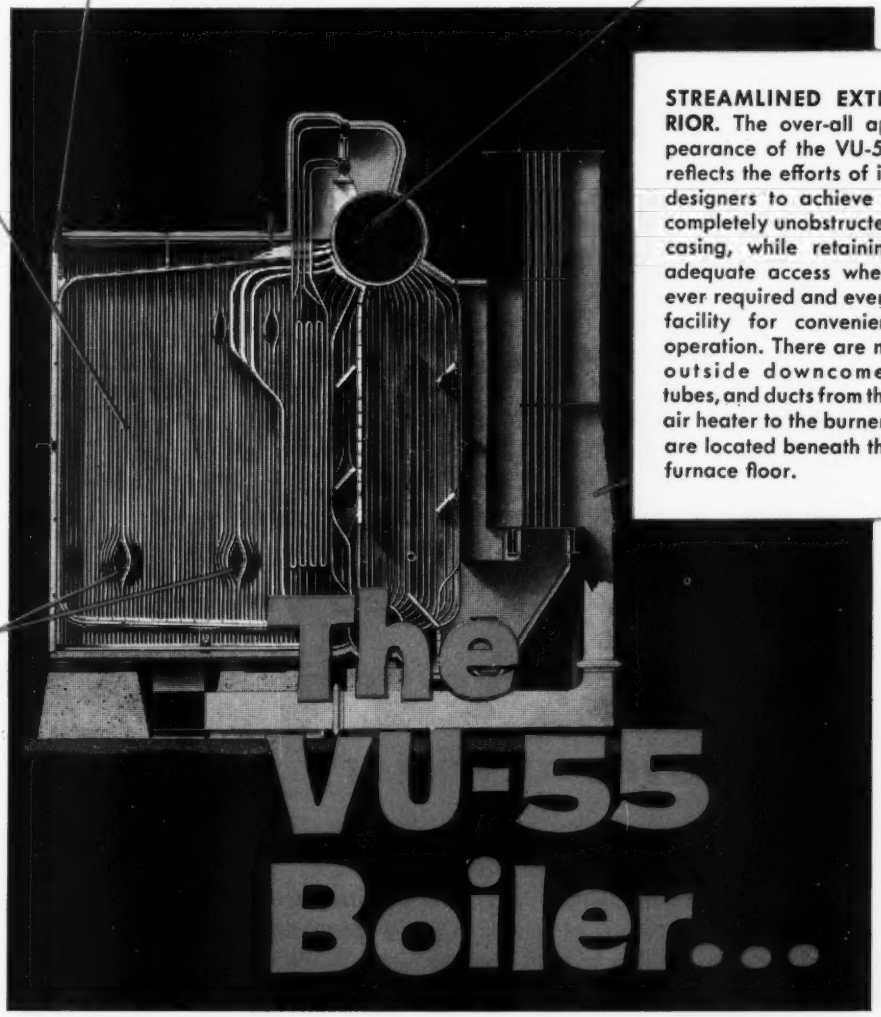
DOUBLE WALL, PRESSURE-TIGHT CASING. The latest development in casing construction for pressure firing of boilers in the size class of the VU-55, this casing is designed to assure life-time tightness with minimum heat loss. Pressure firing permits the elimination of an induced draft fan with its attendant operating and maintenance costs. Construction consists of tangent tubes backed up successively by welded steel panels, 4 inches of high quality insulating material and an outer steel casing formed as shown to provide adequately for expansion and assure ample strength. Low heat loss and the tightness required for pressure firing are assured by this double-wall construction.

HIGH STEAM QUALITY. Equipped with a large (60-in.) steam drum, the VU-55 has generous water capacity and steam reservoir space. C-E drum internals assure high quality steam at all ratings.

TANGENT FURNACE TUBES. The VU-55's furnace tube arrangement provides complete heat-absorbing, water-cooled protection on all furnace walls. Furnace maintenance is minimized, refractory expense is eliminated, heat absorption rates per sq. ft. are higher.

TANGENTIAL FIRING. More than 20 years of application experience have established the exceptional advantages of tangential firing. About 90 per cent of Combustion's large utility installations use this advanced method of firing. Flame streams from the four burners impinge upon one another at high velocity, as shown, creating a turbulence unattainable by any other method of firing. The result is rapid and complete combustion. As the gases spiral upward, they sweep all furnace heating surfaces, assuring a high rate of heat absorption.





STREAMLINED EXTERIOR. The over-all appearance of the VU-55 reflects the efforts of its designers to achieve a completely unobstructed casing, while retaining adequate access wherever required and every facility for convenient operation. There are no outside downcomer tubes, and ducts from the air heater to the burners are located beneath the furnace floor.

The VU-55 Boiler...

Custom Features, Standard Sizes, Advanced Design

The VU-55, newest of the C-E line of Vertical Unit Boilers, represents the closest approach to central station performance yet achieved in standardized boilers in its capacity range.

Its design combines a number of time-tested and service-proved features, such as Tangential Burners, double wall, pressure-tight casing, and tangent furnace tubes. In addition, this bottom-supported unit requires no outside supporting steel, is economical of space and streamlined in appearance.

It is available in 5 sizes for capacities from 50,000 to 120,000 lb per hour. It is designed for 3 pressure ranges (250, 500 and 750 psi) and can be equipped with a superheater to provide temperatures up to 750 F. Either a tubular or a regenerative air heater is available.

The VU-55 Boiler is symmetrical in design, performs efficiently over a wide range of output, and is easy to operate and maintain.

It is, in fact, the boiler with the custom features and the advanced design.

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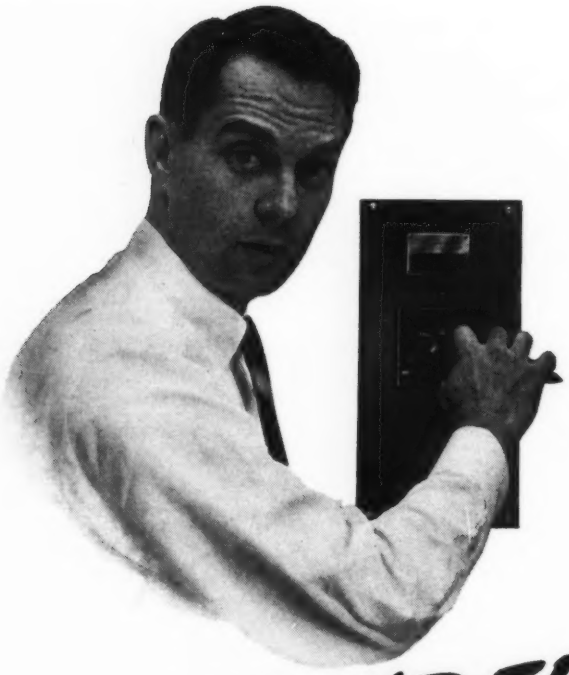
all types of steam generating, fuel burning and related equipment; nuclear reactors; paper mill equipment; pulverizers; flash drying systems; pressure vessels; soil pipe.



REMINDER!

Have you changed your electrical system over to winter?

Let's reduce motor burnouts this year. Remember to change your motor protectors back to winter ratings.

During the hot summer months, many maintenance departments are forced to up-rate the elements in motor protectors to prevent nuisance stoppages due to high temperatures. When winter comes, they neglect to change back to normal ratings. That's when many motor burnouts occur.

ELIMINATE THE WHOLE PROBLEM

You can lick the whole problem, and eliminate motor burnouts too . . . just by using Heinemann Motor Controllers. The rating of Heinemann Motor Controllers is unaffected by heat or cold. No unnecessary stoppages in summer; no change-overs for winter.

The difference is that Heinemann Motor Controllers operate on power, not heat. Instead of thermal elements, they employ a hydraulic-magnetic principle that you should know about.

Send for a copy of Manual 101, *"What you should know about Circuit Breakers"* and Bulletin 1410 on Heinemann Motor Controllers. HEINEMANN ELECTRIC CO., 127 Plum St., Trenton 2, N. J.

HEINEMANN *Motor Controllers*

of the ESA at the present time.

Currently, another major block is preventing organization of consultants' offices in the New York area, Amann explained. "Consulting engineers in New York have a gentleman's agreement between firms. I've been told that this agreement is that salaries will be practically identical in the different firms. A personal folder follows a man from one consultants' office to another. This is common talk among the employees."

Amann added that this, combined with fear on the part of the employees, makes it difficult for the ESA to act at this time.

"We worry a great deal about this agreement. There is no evidence that it exists. But we're strongly suspicious that it does.

"If we organize these engineers, one of the first things we would tackle is this agreement. This would be used as a tool in the campaign.

"Through bargaining groups, we would try to establish competition in the consulting firms. However, the similarity of work the men are doing in different firms makes this a little difficult."

When pressed as to a more exact date when the ESA plans to begin organizing the consultants' employees, Amann said "We're not planning to do anything in this fiscal year."

Guild Activity

Meanwhile, back at the New Hyde Park, Long Island, headquarters of the new Engineers and Scientists Guild, Charles Hall, chairman of the ESG steering committee and also president of the engineering employees' union at the Sperry Gyroscope plants, is busily preparing for a steering committee meeting this month (Oct. 12-14, in Fort Worth).

Hall describes the ESG prospective membership as:

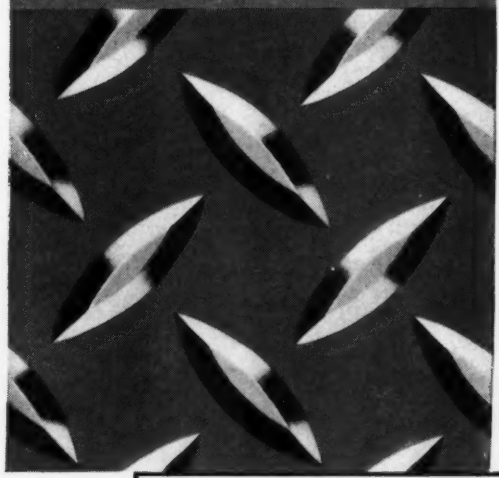
¶ Engineers and Architects Association and Lockheed employees (the Lockheed group left EAA after a disagreement) — 16,000.

¶ Ward Leonard Co. (Yonkers,

WORLD'S LARGEST LADLE CRANE HAS EXTRA SAFETY

WHERE SAFETY COUNTS

Designed for maximum performance, the world's largest ladle crane built by Morgan Engineering Co. can handle . . . in one trip . . . a ladle containing 375 net tons of molten steel. That's efficiency *plus* . . . to which Alan Wood's Super-Diamond floor plate has added *safety!* More than 1,270 sq. ft. of footwalk area on the crane is built of A.W. SUPER-DIAMOND rolled steel floor plate. SUPER-DIAMOND'S anti-slip protection comes from raised diamond-shaped figures . . . alternately spaced at right angles and correct distances. These raised figures give safe foot-gripping from any angle of approach.

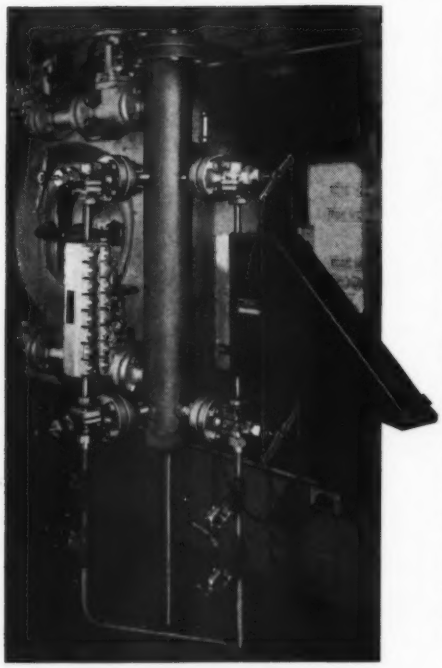


Wherever oil, grease or other substances raise special slipping accident hazards, we suggest a check on the special non-slip qualities of A.W. ALGRIP—the world's only abrasive rolled steel safety floor plate.

A.W. SUPER-DIAMOND
ROLLED STEEL FLOOR PLATE

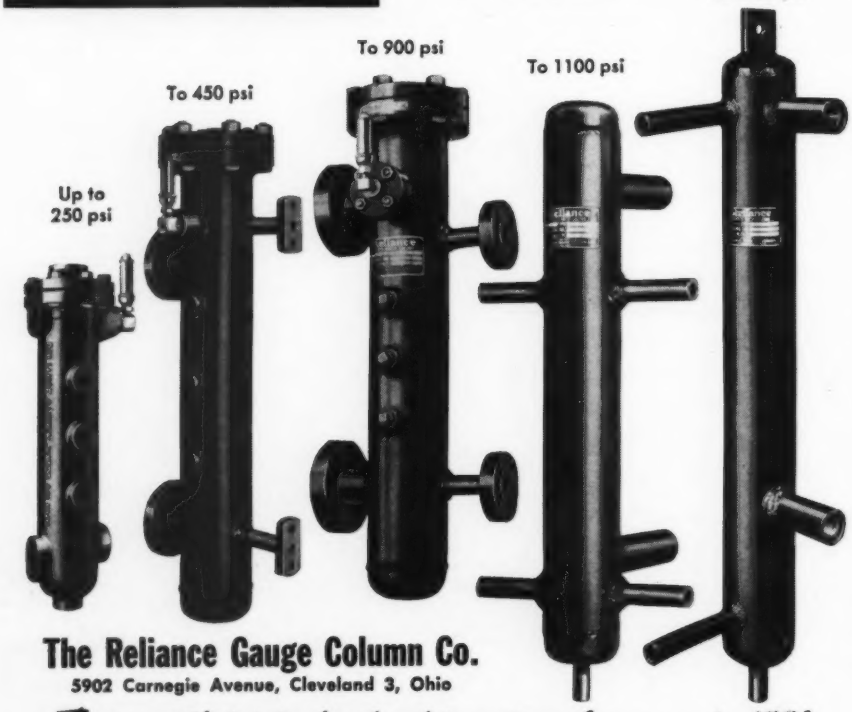
ALAN WOOD STEEL COMPANY • CONSHOHOCKEN, PA.

Insure safe, continuous boiler operation with **Reliance** Water Columns



Water columns have been around for a long time — ever since Reliance introduced the first one in 1884. Its chief reason for existence then was to carry the float-operated whistle alarm and mechanism, to warn operators of dangerously low water in the boiler. Since then, the water column has been developed in various styles and capacities to meet any power plant need. They are used on most boilers today as an accepted necessity, although many old time engineers — and thousands of young ones — can't explain their full usefulness. If you'd like to know "why a water column", write for free copy of our Liquid Level Letter No. 11.

Reliance makes Water Columns in seven pressure categories, five of which are represented below. And complete "trim" — gage cocks, gage valves, gage inserts, special gages and direct-to-drum assemblies. Write for information on equipment suited to your working pressure.



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The name that introduced safety water columns....in 1884

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N.Y., manufacturers of motor and light controls) — 100.

¶ Sperry employees (at five Long Island plants) — 3000.

¶ Railroad Technical Engineers in Chicago — 200.

The TVA Engineers Association, with approximately 2600 members, also recently voted to disaffiliate with Engineers and Scientists of America. At this time, the TVA engineers don't want to join any group. However, they have indicated that they will consider affiliation with Engineers and Scientists Guild at a future date, Hall explained.

Hall agreed that the Guild will not be an organization until a founding convention is held in early 1958. The ESG will include draftsmen, technicians, and all engineering department personnel. "We hope to represent all engineers in the companies."

When asked if he thought engineers and draftsmen had common interests, he said "No, but they would have bargaining strength combined, and this strength would depend on their working together."

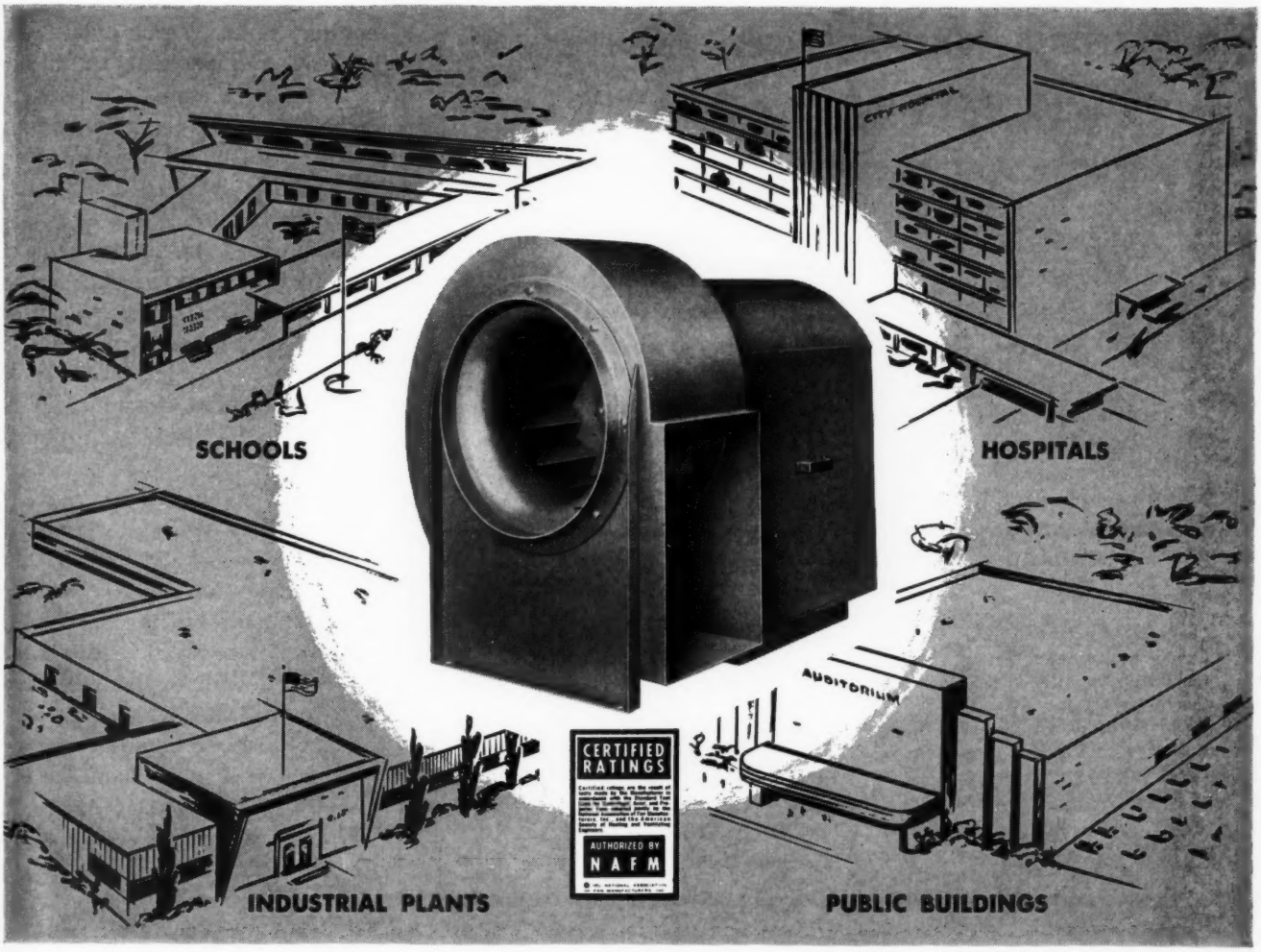
The ESG chairman discounted the idea that draftsmen would outnumber engineers in such an organization. "At Sperry, the engineers outnumber the draftsmen by about five to one. I think that organization is typical."

Who is a Professional?

One of the purposes of the ESG is to set professional standards and in some measure to enforce them. For instance, Hall pointed out that the NSPE hinges professional status on registration. "But the NSPE has no means of enforcing their standards."

Whereas the ESG would encourage registration, Hall said, that would not be their standard for a professional. Registration varies, he pointed out. "An engineer should be a college graduate, or the equivalent, with some experience," he added.

Hall continued to explain that possibly the ESG could set up a



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Peerless blowers meet and excel industry standards. They have been thoroughly tested according to test codes. Thousands of them are providing economical, continuous ventilation in installations all over the country.

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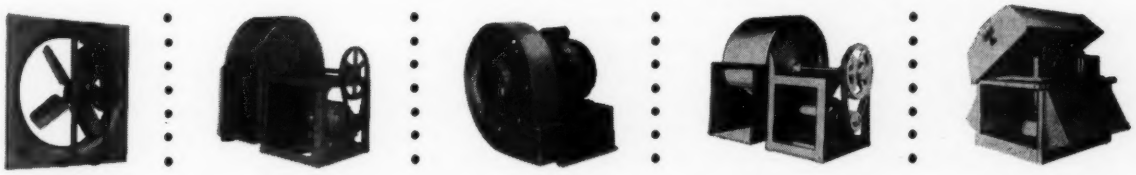

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What do you mean, "CLEAN AIR"?

Clean air is a matter of degree. Air which by some standards has been "filtered" is much too dirty for many applications. In selecting filters, one fact must be kept in mind –

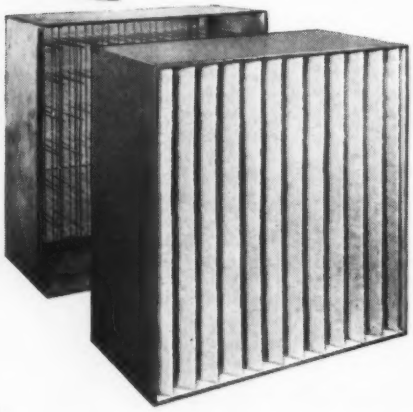
Invisible, Smudge-Producing Particles GO RIGHT THROUGH Most Filters

Only a small percentage of the dust in the atmosphere is visible. Consequently, filters which are reasonably efficient on large dust particles (see ASHAE test below) are much less efficient on atmospheric dust (N.B.S. test) and practically worthless on smoke (DOP test).

STANDARD TESTS — PERCENTAGE OF EFFICIENCY

TYPE FILTER	ASHAE (Weight Test)	NBS TEST # (Atmospheric Dust)	DOP TEST (0.3 Micron Smoke)
Cambridge Absolute	*	*	**99.95 Min.
Cambridge Aerosolve 95	*	90-95	80-85
Cambridge Aerosolve 85	99	80-85	50-60
Cambridge Aerosolve 35	96	30-35	20-30
Electronic Precipitator	99	85-90	60-70
Automatic	76	8-12	2-5
Panel	76	8-12	2-5

*Practically 100%. Test not practical for more accurate reading.
#National Bureau of Standards Discoloration Test.
**Maximum Allowable Penetration of Dioctyl Phthalate Smoke 0.05%. Every filter individually tested.



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Cartridges Interchangeable to Meet Changes in Process or Supply-Air Conditions

The annual owning and operating costs of Cambridge Aerosolve Filters are so low that high efficiency air filtration is now practical on all process and comfort conditioning jobs. Cartridges of three available efficiencies fit the same cadmium-plated permanent frames, so that cartridges of higher or lower efficiency can be substituted without change in the filter system.

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REPRESENTATIVES IN PRINCIPAL CITIES

definition of an engineer, then see that industry complied with the ESG requirements in filling engineering vacancies. "And there are associate engineers, in various grades, who should have a salary scale which is graded accordingly," he continued.

When asked the real reason, in his opinion, for the ESA and ESG-EAA split, Hall said that the ESA does not "really believe in collective bargaining. They're a bunch of super-professionals. Employers don't pay any attention to them."

When does the ESG plan to start actively trying to organize the employees of consultants?

"We have no such immediate plans. It will be three or four years before we actively seek them out," Hall explained. However, he said that within one year, the ESG plans to begin organizing any firm with more than 200 engineering employees.

How does the ESG plan to go about organizing employees in consulting offices?

"I wish I knew," Hall said. He added that the ESG will try proven techniques. The guild will hear about dissatisfied employees by "word of mouth," and then will contact the engineers who would appear to be interested in organizing a guild chapter.

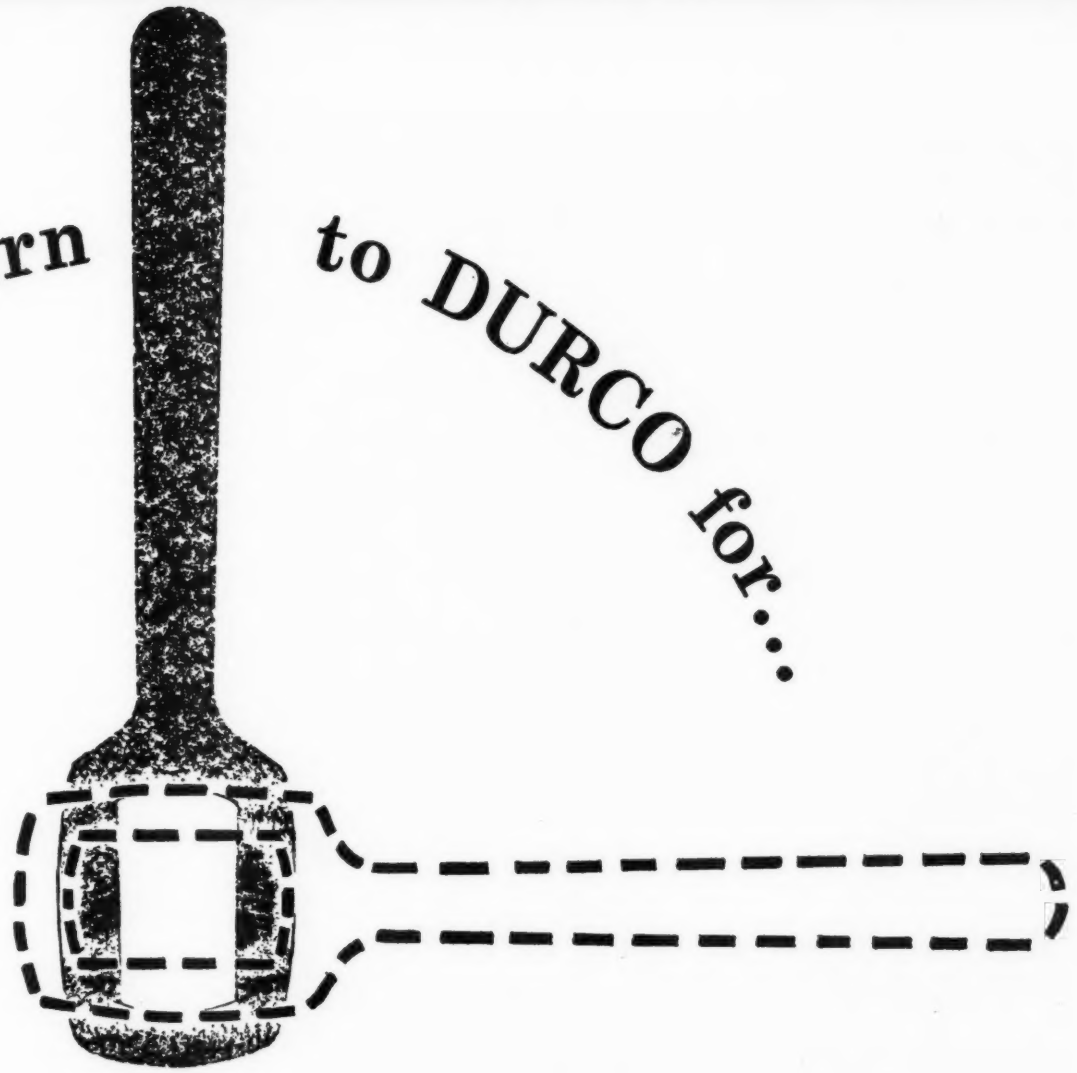
"We have no objections to the ESA organizing anyone they can. The field is large, and we feel there is room for both of us," Hall concluded.

Boston Structurals

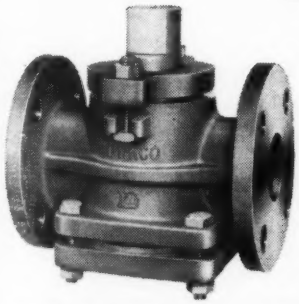
A group of Boston structural engineers in private practice, plans to start meeting again this fall. The group, which includes only structural engineers engaged in building design, disbanded for the summer of 1956 and has not met since.

Maurice A. Reidy, Jr., secretary, explained that the Boston structural engineers formed an organization because they wanted a solution to two problems. First, a fee schedule, for consultants who

Turn to DURCO for...



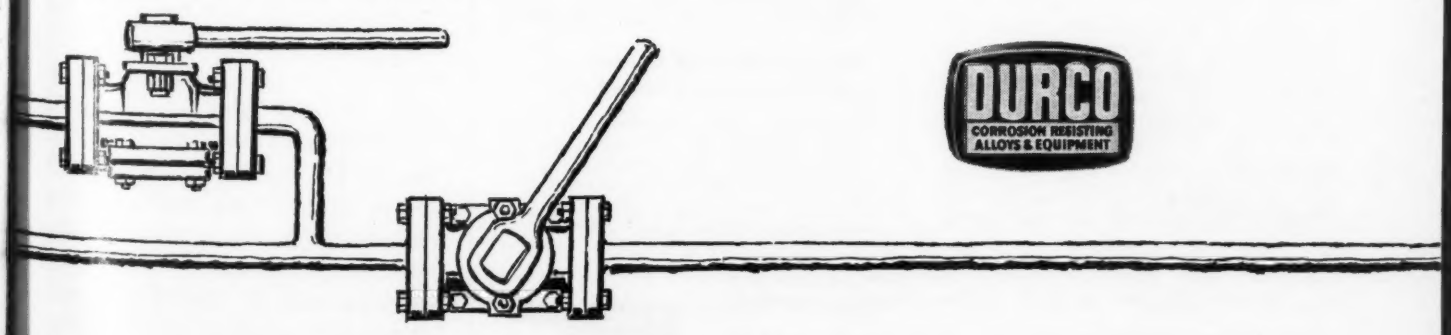
Industry's best chemical service valves



Durco Type F valves are available in 150# and 300# design, as well as three-way. Complete details in Durco Bulletin V/4b.

Durco Type F valves with Teflon sleeves have been proven in thousands of industry's toughest applications to be trouble-free, maintenance-free, and dependable.

Turn to the Durco Type F valve for non-sticking, non-lubricated, economical operation. For long life when handling severe corrosives, get Durco Type F valves. Available in a wide range of alloys in sizes to 3".



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ELECTRIC PLANT
NEWS

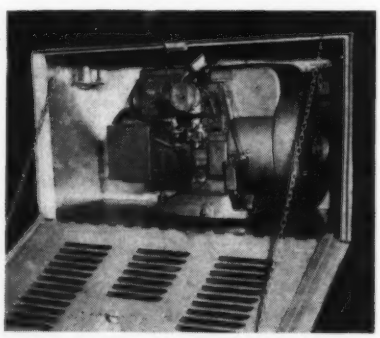
Truck-mounted electric plant cuts costs two ways

Onan Plant provides A.C. power for electric tools and lights, and D.C. output to charge batteries for radio communication.

Utilities using this dual-purpose Onan Electric Plant on trucks report savings ranging from *$2.00 per day* per truck to *$800.00 per year* per truck . . . for the battery-charging feature alone. Before installation of the Onan plant it was necessary to keep the large truck engine running to charge batteries, extremely wasteful from the viewpoint of fuel and engine maintenance.

The Onan plant shown is a Model O7AK, developing 750 watts of A.C. with about 8 amperes for 12-volt battery charging. It is powered by an Onan single-cylinder, air-cooled gasoline engine direct-connected to an Onan all-climate generator in a compact, rigid, long-life unit. A.C. output is sufficient for operation of drills, saws and other tools used for construction and maintenance.

Other vehicular battery charging plants and A.C. models available.



Vacu-Flo cooling system permits enclosed installation

With Onan's Vacu-Flo system, air is drawn (rather than blown) through generator and engine, and discharged through a duct to the outside. An Onan air-cooled plant with Vacu-Flo can be installed in a small compartment within truck or trailer.

Ask your Onan distributor about this dual-purpose unit or write for circular on three battery charging methods.

D. W. ONAN & SONS INC.

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are working with architects, is to be worked out.

The second problem has to do with the fact that in Boston a municipal building committee requires that an affidavit be filed with the plans of each structure. The affidavit, which must be signed by an engineer, states that the proposed structure complies with all requirements of the building code. Sometimes engineers are asked to sign structural plans that were prepared by an architect. Reidy said some plans also are filed with the signature of an engineer who is no more than a draftsman in someone's office and knows very little about the plans he endorsed.

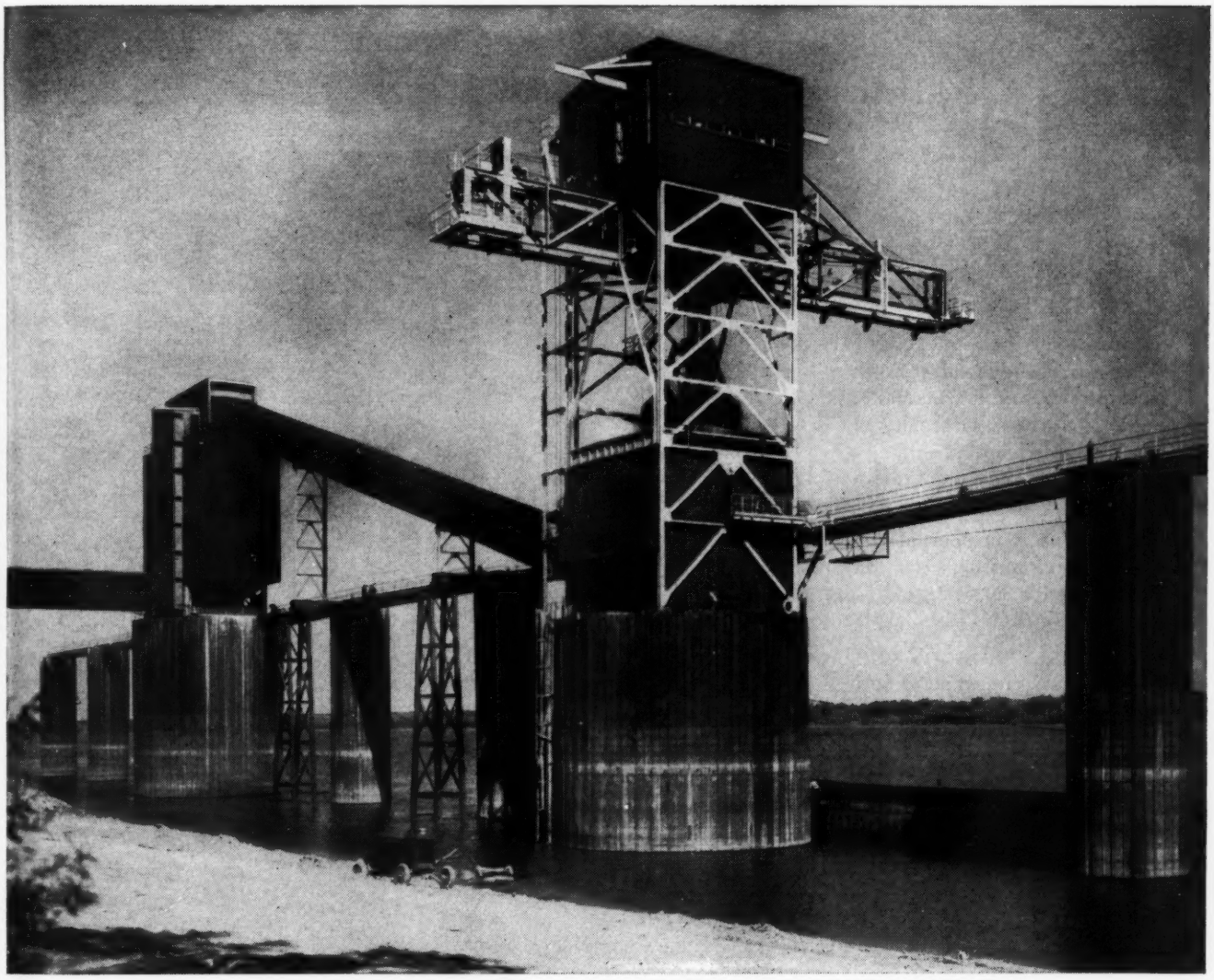
Reidy said that the Boston Association consists of a selected group with common problems. "A mechanical engineer can base his fee on the total project cost or work it out in a number of ways," Reidy explained. "When a structural engineer is engaged by an architect on a project, it is difficult to determine a fee that would be fair to all concerned. There is nothing concrete on which the structural man can base his fee."

Use of Schedule

After a fee schedule is worked out, Reidy said there is a possibility that the schedule would be submitted to the Boston or Massachusetts chapter of ASCE, or to the Massachusetts Society of Professional Engineers.

"I'm not convinced that the organization of an association of consulting engineers would be the solution to our problems," Reidy explained.

"If the men who would organize such a group would devote the same amount of time and energy to working with existing organizations, much would be accomplished. Besides, in working with the ASCE, the MSPE, and others, you have the prestige, the large membership, and a long history of accomplishment behind you."



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Dravo experience in the design and construction of complete bulk materials handling installations can help you lower coal handling costs materially. Take the facility shown above. The cellular steel sheet pile dock requires no maintenance, provides safe mooring for barges and supports the barge shifters, other auxiliaries and the unloading tower.

This all-welded tower has a single hoist motor and drum which perform all hoisting and lowering operations. Hoisting rope pull is equalized, and a counterweight reduces hoisting horsepower. A separate drive provides independent and positive bucket closing.

Dravo facilities provide for the design, fabrication and erection of the complete job. Tower, dock and auxiliaries are integrated into a smooth-running installation designed to operate at maximum efficiency and low cost.

Dravo heavy materials handling equipment is at work in power plants, steel mills, port docks and other materials transfer points. You can learn about Dravo's complete line of trolleys, bridges, towers and other related equipment by writing for Bulletin #225. Better still, let us arrange for your visit to actual installations. Simply call us at Pittsburgh, Spalding 1-1200, or write DRAVO CORPORATION, PITTSBURGH 25, PENNSYLVANIA.

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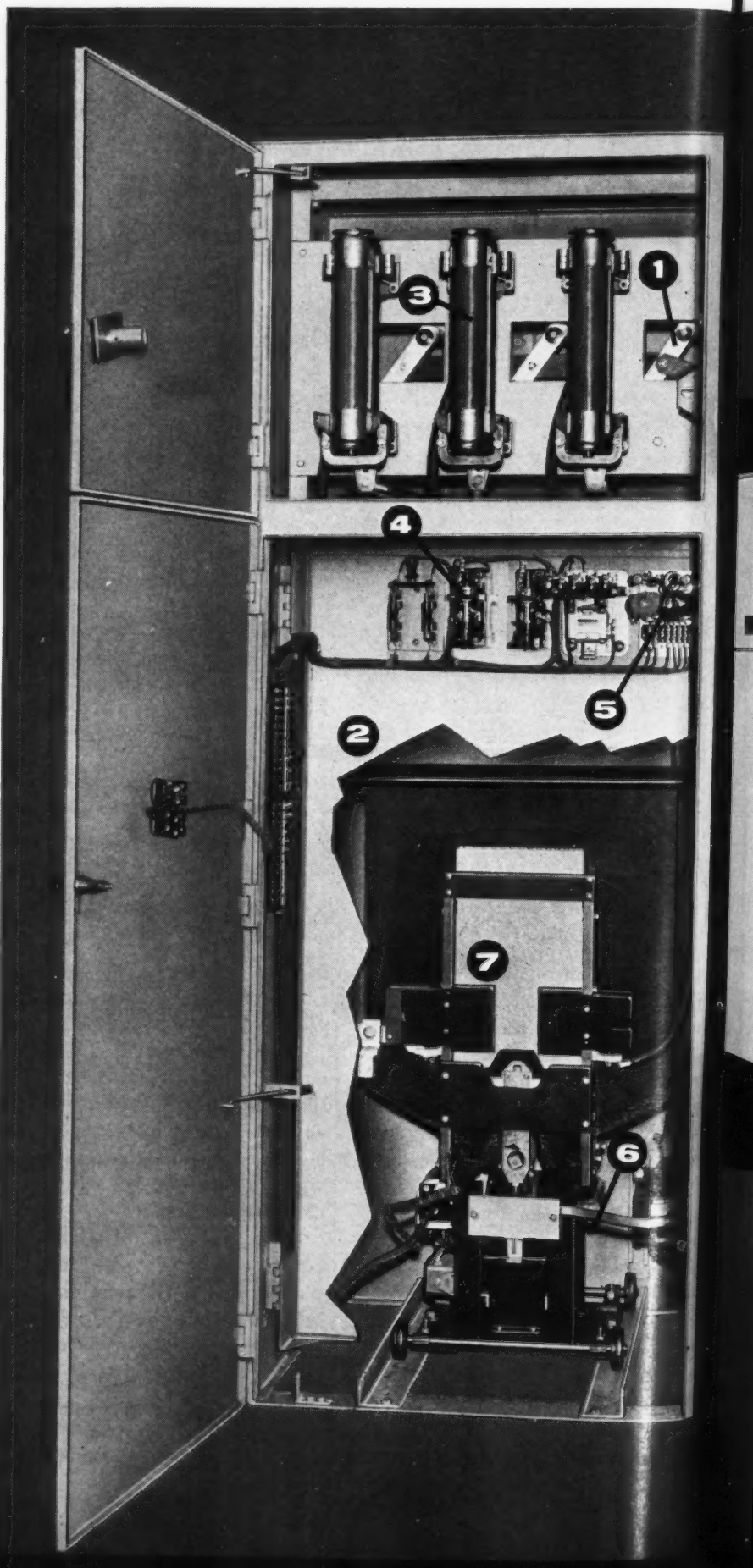
Allis-Chalmers announces... **Newly**



1

Gang-operated disconnect switch isolates starter from incoming power — assures safe entry of high voltage compartments.

2

Steel cubicle is compartmentalized — separates high and low voltage equipment.

3

Short-circuit protection is provided by fast-acting current-limiting fuses, rated 150,000 kva at 2300 volts and 250,000 kva at 4160 or 4600 volts.

4

Overload protection is handled by accurate relays which trip only on excessive motor current, preventing needless motor stoppages.

5

Undervoltage protection instantaneously opens line contactor on loss of voltage. Time-delay undervoltage protection also available.

6

Mechanical interlock coordinates contactor, disconnect switch, upper door and inner control barrier for maximum safety.

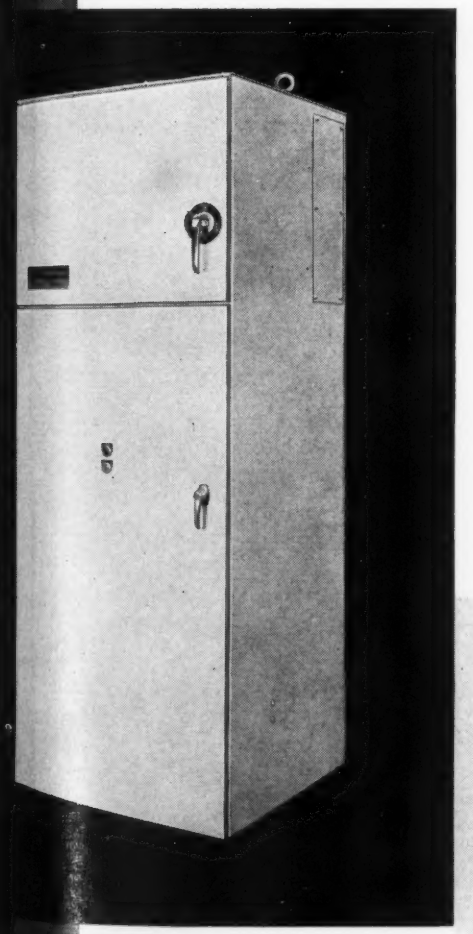
7

Roll-out contactor makes maintenance easy—even in narrowest aisle space. (Routine inspection and maintenance can be done with contactor in place.)

Designed

Type H High Voltage Motor Control

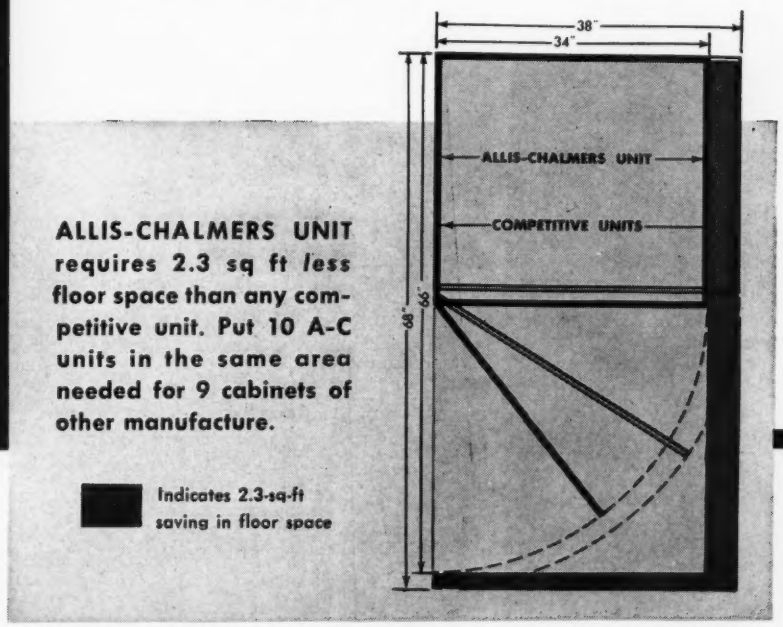
Combines front access with space economy...



In addition, you get maximum protection for personnel and machines, thoroughly tested components, and ample panel space for modifications. It's all built into the *smaller cabinet* of a newly designed line of Type H high voltage starters from Allis-Chalmers.

Here is control that couples compactness with roominess (for ease of maintenance) . . . here is a starter that joins test-proven performance with versatility (for addition of meters and relays) — AND the line meets every 2300 to 5000-volt motor need.

For more information on this engineering advance, contact your A-C representative or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.



ALLIS-CHALMERS UNIT requires 2.3 sq ft less floor space than any competitive unit. Put 10 A-C units in the same area needed for 9 cabinets of other manufacture.

Indicates 2.3-sq-ft saving in floor space

ALLIS-CHALMERS

A-5517

Beyond Our Borders

Largest Radio Telescope

The world's largest radio telescope — at Jodrell Bank, Cheshire, Eng., is now nearing completion and will be ready for use by University of Manchester observatory scientists sometime this fall.

Conceived in 1941 and built with financial aid from the Department of Scientific and Industrial Research and the Nuffield Foundation, the new radio telescope has been designed and constructed under the supervision of H. C. Husband, of Husband and Co., consulting engineers of Sheffield, England. Two thousand tons of steel girders and plates have gone into the structure, 750 tons of which are in the bowl of the telescope itself. The bowl is 250 feet across and is suspended between two columns,

PHOTO SHOWS TELESCOPE ALMOST COMPLETED.

each 185 feet high. It can be rotated on a 17-in. gage circular track, 360 feet in diameter, and is carried by twelve bogies, four of which have electric motors. Each of these bogies weighs 20 tons.

The new telescope is three times bigger than any other completely steerable radio telescope in the world and with it Manchester University scientists expect to be able to reach to the outermost limits of the universe. It will have an advantage over optical telescopes in that it will be able to operate in all kinds of weather and by day as well as by night.

A control room is located 200 yards from the center of the telescope and, at a push of a button, the great bowl can be turned in any direction, vertically or horizontally, and can even be turned completely upside down.

African Defense Highway

A strategic highway stretching from Cape Town to Kenya, a distance of 3500 miles, is the first step in realizing the long-debated plans for the defense of Africa south of the Sahara. A proposal to spend $80 million to make it a first-class international highway has been studied by the African Regional Road Conference, in Salisbury. Mozambique and South Africa together will spend another $105 million in the next ten years on the Great North Road. High priority will be given to the dust road crossing the mile-wide Zambezi at Tete with its tenuous ferry link. At present impassable after rains, this 300-mile stretch linking Rhodesia with Nyasaland is to be fully tarred. However, Rhodes' 70-year-old dream of a direct Cape to Cairo route will stay incomplete while the 2500 miles through the Sudan and Egypt remain unlinked with the South Africa scheme.

Cantilever Bridge

Work is moving ahead on Canada's second longest cantilever brige connecting Vancouver and North Vancouver, British Columbia. Completion of the steel and concrete project is scheduled for 1959, at

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dds incomparable distinction to any commercial interior

he imaginative use of decorative lighting is an all-important ement in today's most widely acclaimed hotels, motels, stores, fices and institutions. By specifying the superb IL* fixtures own in Moe Light's exciting new Commercial Lighting Catalog, u can add beauty and originality to your commercial installa- ons. They combine functional lighting with a dramatic indi- duality that results from the creative use of well-designed corative appointments.

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Famous Cordette Casuals by Moe Light can create many moods — in this interior, they add a gracious look to the dining area, while lending an air of informality to the bar.

(Fixtures shown: M-1427 3-Lite cluster in main dining area; M-1437 "3-in-line" accents the wall; M-1421 cones over bar.)

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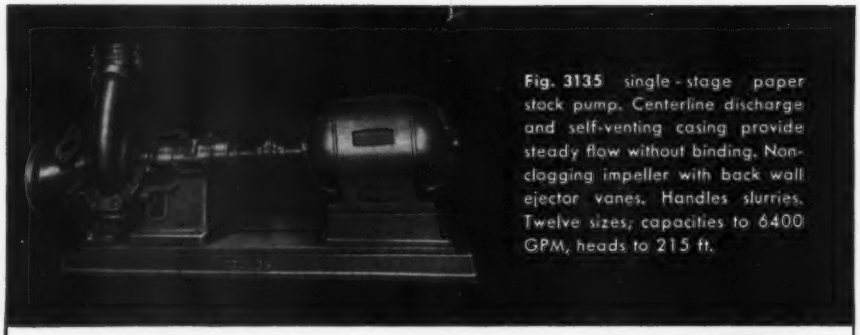
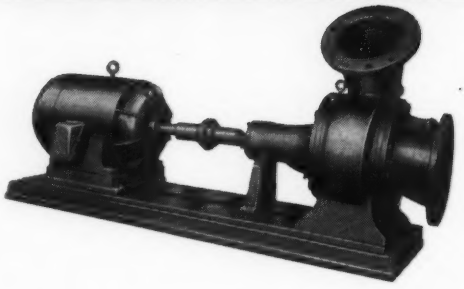


Fig. 3135 single-stage paper stock pump. Centerline discharge and self-venting casing provide steady flow without binding. Non-clogging impeller with back wall ejector vanes. Handles slurries. Twelve sizes; capacities to 6400 GPM, heads to 215 ft.

Fig. 3138-39. Specially designed for heavy duty service, pumping corrosive or noncorrosive liquids, with or without solids in suspension. Vertically split casing, "back pull-out" design. Four sizes; capacities to 9000 GPM, heads to 160 ft.



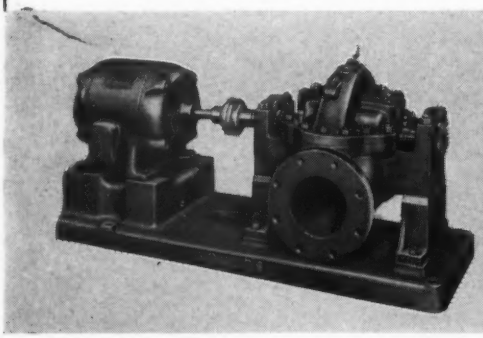


Fig. 3405 single-stage, double-suction pump. All sizes and pump combinations based on only 3 shaft and bearing assemblies. Mechanical seals or stuffing boxes. Rotation can be changed in field. Thirty-three sizes; capacities to 6400 GPM, heads to 425 ft.

GET QUICK ANSWERS TO CORROSIVE PUMPING PROBLEMS

You can solve corrosive pumping problems quickly because a number of Goulds centrifugal pumps now come in a wide range of special metals.

You can get them with fluid ends in your choice of the special metals listed below. Just match the special metal to your pumping problem.

All Bronze
Type 2 Ni-Resist
All Iron
Bronze Fitted
Nickel Aluminum Bronze
Steel and Steel Alloys

What's more, you'll get prompt delivery on these pumps (or any of four other types) in corrosion-resistant constructions from Goulds foundries.

You can keep spare parts inventory low, and meet quick changes in process requirements because Goulds pumps are designed with standardized parts for easy interchange between sizes.

Bulletin 5252-J has brief descriptions of these pumps (and the Goulds-Pfaudler *glassed* pump). Write for a copy.

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NEW YORK CITY, Room 1503, 11 Park Place
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West Coast Representative: GOULDS PUMPS Western, Inc., 1919 N.W. Thurman St., Portland 9, Oregon
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an estimated cost of $20 million.

Undertaken for the province's Toll Highways and Bridges Authority of the Department of Highways, the bridge will span the Second Narrows approach to Vancouver Harbor. Bridge length will be 4250 feet and total construction length, including roads and overpasses, 5½ miles.

At the north end of the structure 108 bridge stringers are being cast in prestressed concrete. Each stringer is 120 feet long, 7 feet high, and weighs 75 tons. Advantages claimed for these beams are lower cost than steel, less maintenance, and avoidance of complicated falsework, since the stringers can be raised into position from the ground.

Thirteen bridge piers have been finished, and two more, the anchor and main piers, are in preliminary construction stage.

Flood current of 7½ miles per hour, with flow from two rivers east and west, presents a special problem. Because of flow variations in the channel, engineers stress that the location is particularly hazardous for caisson control and handling of floating equipment.

Other main features include a center span of 110 feet with vertical clearance of 145 feet for vessels at high water. Six traffic lanes will have a center dividing strip and a total width of 80 feet.

Consulting engineers for the project are Swan, Wooster and Partners, Vancouver, B.C.

Australian Irrigation Scheme

The government of New South Wales, Australia, has approved a $4,500,000 irrigation project for an area of the Murrumbidgee Valley by use of water soon to become available from the Snowy Mountains hydroelectric project.

A concrete diversion weir will be built at Gogeldrie on the Murrumbidgee, an earthern block dam near the weir, the diversion channels extending 14 miles north and 10 miles south of the river. The scheme will create 875 irrigated

TOOK LESS STEEL TO BUILD BECAUSE IT'S WELDED

FABRICATED and erected by arc welding, this San Francisco Skyway illustrates the savings in steel and construction cost possible today by the correct use of welded bridge designs. All columns are fabicated from standard rolled shapes. Maximum strength per pound of steel is assured at low cost because welded design permits steel to be placed economically where it has the most efficient load carrying ability.

Designed under the direction of Wendell F. Pond, Senior Bridge Engineer and Supervisor of Bridge Design for the State of California.

Bridge Designers! Aids available on welded bridge design are:

Bridge Design Seminars now held regularly at the Lincoln plant in Cleveland, Ohio.

New "Procedure Handbook of Arc Welding Design and Practice". Available at small cost, it has 466 pages devoted to structural design.

"Studies in Structural Arc Welding", design bulletins sent regularly to engineers at no cost.

For additional information write . . .

THE LINCOLN ELECTRIC COMPANY

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The World's Largest Manufacturer of Arc Welding Equipment

When welding saves steel

Has simpler design

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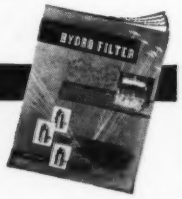
WHY use anything but welded construction

Unique turbulent area assures positive dust collection at constant efficiency . . . to the micron range

Here is the "heart" of the Hydro-Filter principle of dust separation. This violently turbulent area of water, bubbles and mist is produced by the countercurrent action of air against water. Constant long contact between the air being cleaned and the water which is doing the cleaning produces a scrubbing action which is positive, thorough and unaffected by variation in volume and velocity of flow. Dust is entrained by any, or all, of three means: (1) Entrapment within falling water droplets; (2) Impingement on bubble surfaces; (3) Impingement on wetted surface of glass spheres.

As the photo indicates, the entire collection area is continually flushed. There are no dead areas to corrode or erode. No moving parts to "load up" and reduce efficiency. Maintenance is a matter of *minutes a month*. Collection of dust to micron size is continuous and sludge removal automatic with the National Hydro-Filter.



Write for Bulletin 55 . . .

See why and how separating efficiencies of up to 98.9% on foundry shakeout dust are possible practical—and continuous with Hydro-Filter!

NATIONAL

Dust Collector Corp.

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Subsidiary of National Engineering Company, Manufacturer of Simpson Mix-Mullers.

farms suitable for fruit-growing, mixed farming, and fat lamb raising. The Snowy Mountains project, now under construction in the southeast corner of New South Wales, ultimately will make available annually nearly two million acre feet of water for irrigation.

Ethiopian Highway Plans

A highway development program is in full swing in Ethiopia, where already 2900 miles of road have been repaired. The next phase of this program is the extension of the all-weather road network to about 3400 miles, which will involve the building of six new highways and improvement of the existing network. The Ethiopian authorities are undertaking this project, essential to the country's economic development, with the aid of a $15 million loan from the International Bank for Reconstruction and Development, Washington, D.C.

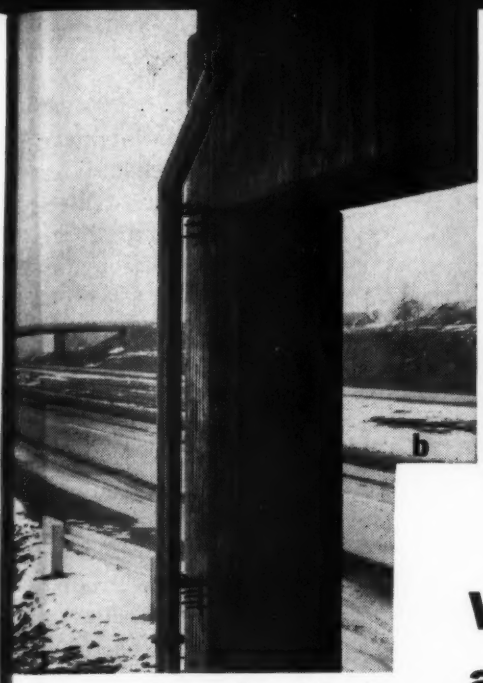
Russian Technical Aid

The Moscow government agency promoting technical aid abroad has contracts for engineering the construction of more than 500 different industrial plants in China, India, Afghanistan, Egypt, eastern Europe, and elsewhere, according to the official publication of the Ministry of Foreign Trade *USSR*. The Moscow technical and contract portfolio embraces 26 steel plants, 31 nonferrous metallurgical works, 5 oil refineries, 2 oil pipelines, 29 chemical plants, 60 thermal and hydroelectric power stations, the Russian trade paper said, adding that recent business had been greatest in the Middle East.

Geothermic Power

Geothermic energy (steam from the earth) may soon be supplying half the power requirements of Mexico City and its suburbs, according to plans of the Federal Electric Commission.

The country is well provided with potential geysers, especially in the central plateau area, which



b

c

Wrought Iron's corrosion resistance and easy workability earn top priority in these highway applications

a Wrought Iron railings offer high impact resistance because of their great structural strength. Easy to work and easy to weld, wrought iron railings stand up well in corrosive atmospheres.

b Wrought Iron drainage lines assure uninterrupted service—so essential in keeping high speed traffic lanes open. No costly maintenance or repairs with this durable piping material on the job.

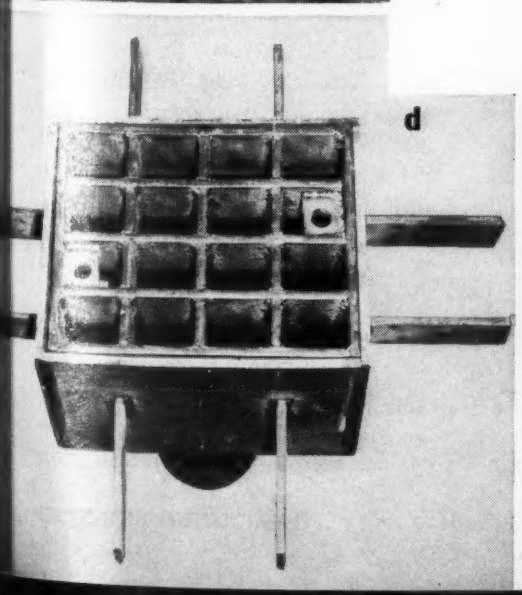
c Wrought Iron snow melting systems like the one on this bridge ramp, combine corrosion resistance with rugged strength, low coefficient of expansion with concrete, and easy fabrication properties.

d Wrought Iron scuppers serve as low-cost catch basins in bridge drainage systems. Cindering and salting and alternating wet and dry conditions have proved relatively harmless to this rugged material.

e Wrought Iron curbing preserves concrete against icing salts, brine slush, drainage water and corrosive atmosphere. Wrought iron's resistance to corrosion stems from a unique structure of glasslike iron silicate fibers. Write for booklet, *Wrought Iron for Highway Construction*. A. M. Byers Company, Clark Building, Pittsburgh 22, Pa.

BYERS Wrought Iron Tubular and Hot Rolled Products

ALSO ELECTRIC FURNACE QUALITY STEEL PRODUCTS



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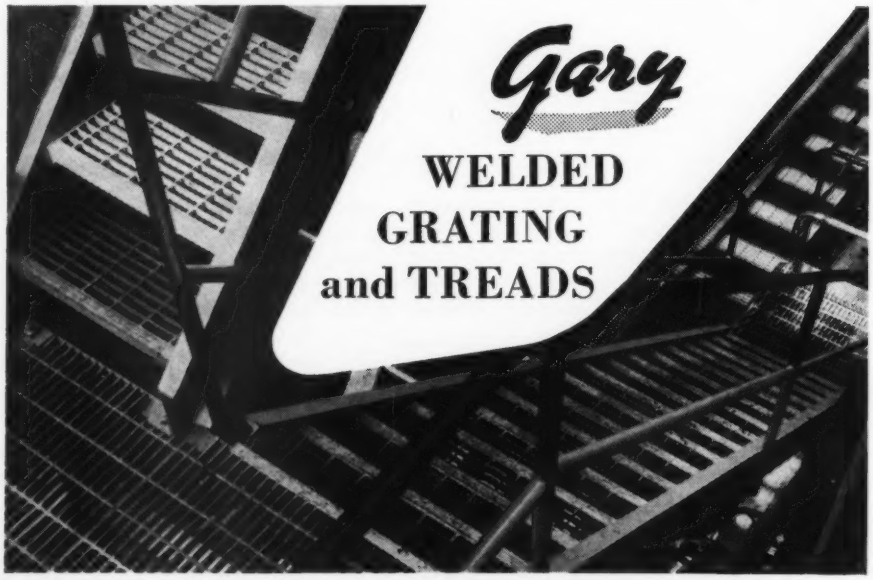

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- **TAILOR MADE**—for most economical installation.
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Write For Bulletin CE-107

ROCKWELL SRA

ROCKWELL SPRING & AXLE CO.
GARY GRATING DIV.
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extends almost from the Mexican Gulf to the Pacific Ocean. This is the area in which most electricity is consumed and where most important industrial installations are located.

Three steam wells have already been sunk in Hidalgo State, north of Mexico City, and the first geyser, which gushed last year, is estimated to have a power capacity of 25,000 kilowatts. The Commission intends to bore some ten to twelve wells capable of producing at least 250,000 kilowatts. Production savings through the use of geothermic power are expected to run to 15,000,000 pesos ($1,200,000) annually per well.

Swedish Paper Mill

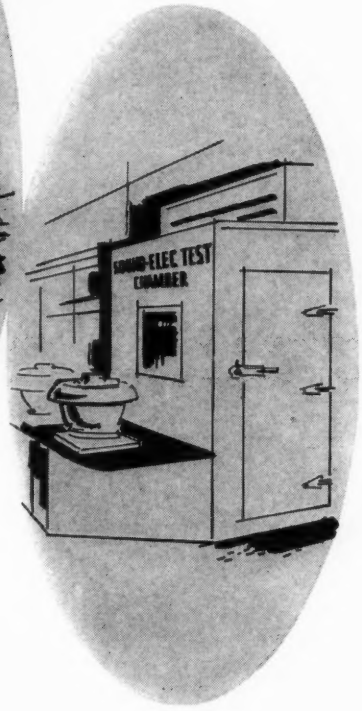
The construction firms of Anders Dios and J. E. Backstrom of Sundsvall, Sweden, are building a new plant for the Swedish Cellulose Co. Ortviken, the first part of which will be ready in 1958. Building costs are estimated at 15 million crowns ($3 million). The Stockholm firm of Gronwall and Hirsch are the architects.

These buildings, when completed, will house the largest paper machines in the world, now being assembled by Karlstad Mekaniska Verkstad (Karlstad Machine Works) at the Sulphite Mill, situated at Skonsberg. The first machine, which will be ready in December, weighs 4½ million lbs and costs $2,325,000 for the machine itself, without the numerous accessories. Several thousand drawings were necessary before the assembly could start. To give an idea of its size, it is estimated that 100 freight cars would be necessary to transport it if it were moved all at one time. Work on it was started four years ago. The 70 cylinders weigh nine tons each. The drying assembly measures 204 feet.

The Fourdrinier paper machine, which is the main component, will turn out 660 yards of newsprint a minute with a width of 7 yards.

The demand for cellulose is explained by the fact that Sweden

1
FOLLOW THROUGH ENGINEERING.
From drafting board to final product, a single policy dictates Jenn-Air engineering: Jenn-Air exhausters must be better designed. Primary objective is—how well can we make the products? . . . not how cheaply or how quickly.



2
FOLLOW THROUGH MANUFACTURING.
Jenn-Air exhausters are constructed of ageless spun aluminum and stainless steel—motors lubricated for 10 years of normal operation. Each unit must pass final scrutiny of exacting vibronic Eye to guarantee minimum vibration—low noise level.

3
FOLLOW THROUGH SERVICE.
Jenn-Air's sense of responsibility never diminishes. Fifty-two national sales offices with 66 warehouse stocks—field engineers everywhere—provide the fastest over-night service throughout the U.S.A., the easiest-to-obtain consultation.

WHY IS JENN-AIR BETTER THAN "OR EQUAL"?

FOLLOW THROUGH ENGINEERING—MANUFACTURING—SERVICE MAKE THE BIG DIFFERENCE IN JENN-AIR POWER EXHAUSTERS

In the specification of materials or products that go into a building a commonly-used term is "or equal." Because of the principles behind Jenn-Air Quiet-Tested roof and wall exhausters, we like to believe there is *no equal* to Jenn-Air. The Jenn-Air creed demands:

Jenn-Air FOLLOW THROUGH has no "or equal."

Jenn-Air Quiet-Test Roof Exhauster, with U-Spring Cushion Suspension Mounting. Note low contour design.

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SPECIAL DELIVERY for liquids and gases in all branches of industry is assured with Kraloy Rigid Polyvinyl Chloride (normal and high impact) Plastic Pipe... with virtually no maintenance or policing. You install Kraloy PVC—and forget it. That's why millions of feet of Kraloy Plastic Pipe are in use today, because Kraloy PVC is inert and can never rust, rot, or corrode, is not subject to electrolytic action, handles abrasives, slurry and most Ph factors, is scale resistant. Superior flow characteristics (C factor = 150+) permit use of smaller diameters. Installation costs 50% less, due to light weight and ease of handling.

Write for complete information and literature.

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400 KVA, 3-Phase
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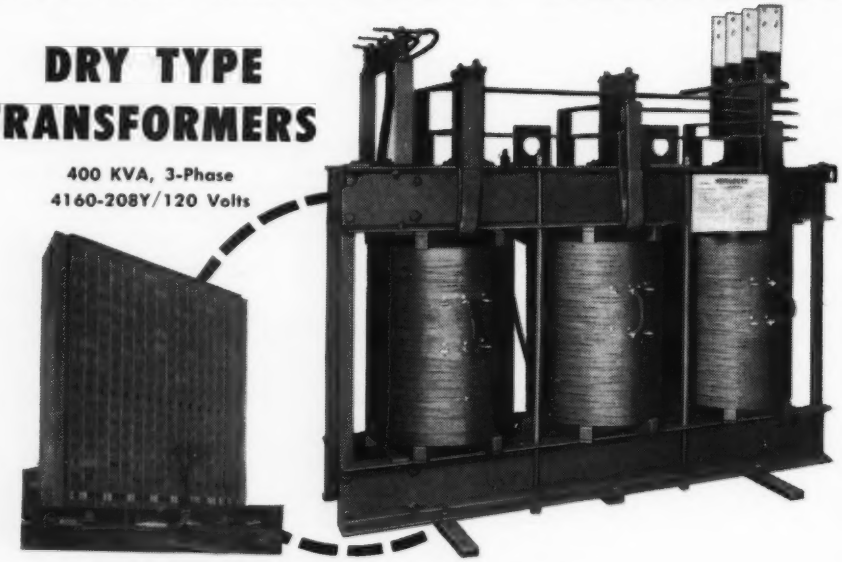

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is not only a great exporter of paper but also consumes large quantities for newspapers, magazines, and house organs.

High-Strength Cement

S. A. Cimenteries & Briqueteries Reunies, Brussels, Belgium, has developed an early high-strength Portland cement known as C.B.R. III that complies with ASTM C 150-1955 specifications, sets normally, but hardens very rapidly. A Gilmore test shows average results as: initial setting — 1 hr 40 min; final setting — 4 hr 30 min.

The high early strength of C.B.R. III is due largely to the exceptionally fine grind of a special type of clinker obtained by highly perfected Belgian equipment in C.B.R.'s mills.

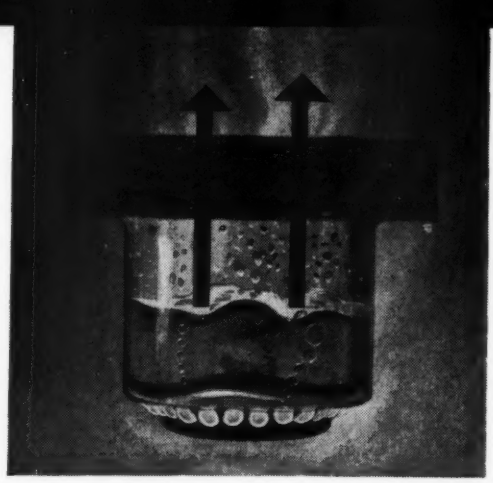
The manufacturer says that C.B.R. III surpasses the U. S. Federal Government and ASTM specifications for both Types I and III — 2400 psi compressive strength after 24 hours. The total alkali content is said to be about 0.50 percent but the soluble alkali does not exceed 0.2 percent.

Rapid development of high early strength is not obtained by the addition of chemical products. No calcium chloride ($CaCl_2$) or other accelerators are used.

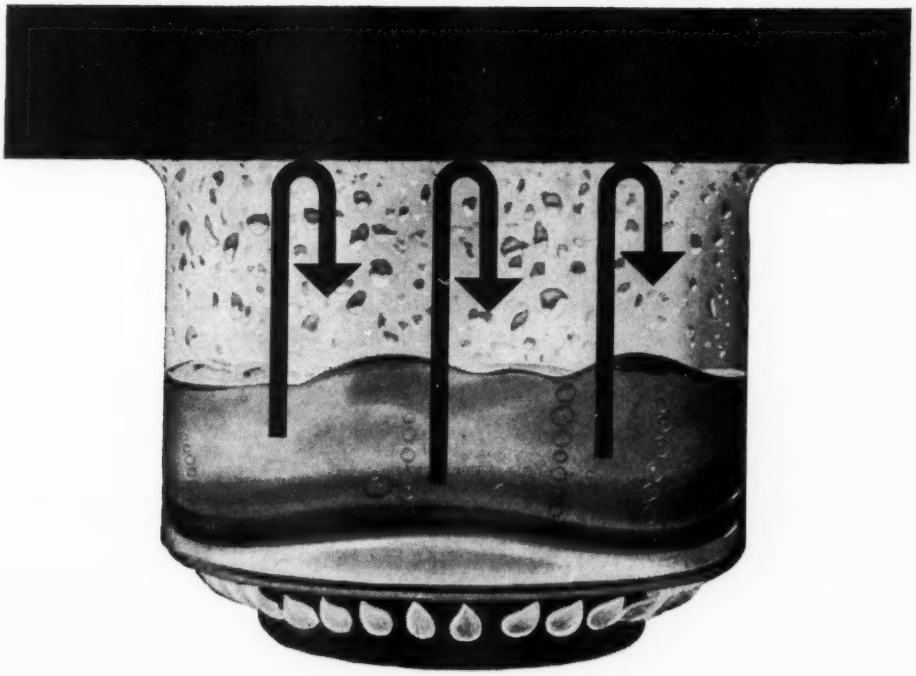
North and South To Be Linked

A $25 million project, involving construction of a 187-mile long meter-gage railroad to connect Khandwa with Hingoli in central India, has been initiated by Indian Railways. The first phase of the project, one of the biggest planned by the railways in the postwar period, has been completed: the laying of 18.6 miles of track and the construction of two new stations. The entire project is expected to be completed by the end of 1959.

Khandwa is the terminus of the 10,113-mile meter-gage rail system of northern India, and Hingoli marks the terminus of the meter-gage system in the southern area with a mileage of 4933.



Some insulations transmit vapor



FOAMGLAS®

INSULATION

is vapor-proof . . .

needs no separate vapor barrier!

—and inorganic FOAMGLAS is dimensionally stable . . . waterproof . . . easily carries loads of 7 tons per sq. ft. . . . can't burn . . . repels all vermin . . . easy, economical to handle and install. Write for detailed literature.

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APPLYING INSULATION TO PIPING?

There are 12 sound reasons why you should try:

Swift's *Improved* **LAGGING ADHESIVE**

There is an improved way to apply insulation. Whether you're bonding insulation to piping or adhering lagging cloth to insulation, Swift's Lagging Adhesives give you 12 important advantages:

1. EASY TO USE
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WRITE FOR LITERATURE

Swift

To Serve Your Industry Better

Although the need for a link between the two systems has been recognized for years, construction, involving the laying of about 187 miles of new rail and erection of 48 large and 483 smaller bridges, was not authorized until 1954.

Completion of the project, in addition to providing a direct link between the two systems, is expected also to open up undeveloped areas in the Vidarbha area of Bombay State, through which the new track will pass.

At the present time, the Indian railway system, comprising nearly 36,000 route miles, is the fourth largest in the world. With the exception of a few miles of narrow-gage line, the system is owned by the Government and managed and operated by the Railway Board, which is a part of the Ministry of Railways.

The railways are by far the most important form of transportation in India, where highways, rivers, and coastal shipping cannot handle large volumes of long-haul traffic.

Steelworks Near Completion

The German firm of Demag is to complete the Egyptian steelworks at Helwan this year. The integrated steelworks includes two blast furnaces, a mixer, three basic Bessemer converters, two electric furnaces, a 2-high reversing blooming mill, a 3-stand 2-high roughing and finishing train, and a heavy and medium plate and sheet train consisting of a 3-high stand and a 2-high stand. Annual raw steel capacity will be 265,000 metric tons, of which 235,000 tons will be basic Bessemer and 30,000 tons electric. By adding two 600-ton-per-day blast furnaces, annual steel capacity could be raised to half a million tons. The rolling program will include production of bars, sections, rails, sleepers, fishplates, plates, and sheets.

Coke will be imported, but the necessary iron ore will come from Aswan, where production, which is already under way, is expected to rise to 300,000 tons a year.

The first blast furnace and some steelmaking equipment is scheduled to start up next summer. The entire works will be in operation by the end of 1958, about two and a half years after the foundation stone was laid. The works will be operated by Societe Egytienne pour le Fer et.

Canadians Map Far North

Over a third of the surveyors, topographical engineers, and hydrographers that Canada's Department of Mines and Technical Surveys sent into the field this year went to the far north to obtain information required for production of vitally needed new maps and charts. One group of hydrographers are working out safe navigable routes for shipments of nickel from nickel-mining operations in the Rankin Inlet area on the west coast of Hudson Bay in the Northwest Territories. The route will take ships through Hudson Bay and Hudson Strait to the Atlantic Ocean.

Largest mapping projects will be carried out by two topographical helicopter parties who will map large blocks of territory, one in northwestern Canada and the other in the northwestern corner of Ungava; and by a shoran party which will complete, with the RCAF, the main framework of control (latitude and longitude) for mapping the Arctic Islands.

In Ungava, Branch topographers this year will use the tellurometer, the newest instrument for the measurement of distance. It was developed in South Africa and has all the earmarks of revolutionizing surveying techniques. Distances of from 1000 feet to 35 miles can be measured with greater accuracy than by any other available practical method.

In other northern projects, a radar altimeter party will fly large expanses of Arctic waste lands recording land heights electronically for air navigation charts and for other maps. Topographical

SORGEL — the Quietest dry-type transformers at standard prices

WE GUARANTEE that the sound levels of ALL Sorgel dry-type transformers are well below the established standards in ALL ratings up to 3000 Kva, and all voltages up to 15,000 volts. This has been an outstanding feature in Sorgel transformers for many years; in fact, we are the **originators** in establishing low sound levels.

OUR MODERN TESTING FACILITIES enable us to prove the low sound level, efficiency, temperature rise, and performance of Sorgel transformers, before installation.

COST LESS TO INSTALL, because they are all self-contained in a single unit — either single phase or 3-phase — equipped with substantial wall brackets or floor mounting base. No separate brackets to make or buy. Easily accessible, roomy connection compartment, with wide choice of knockouts. Solderless terminals.

OTHER INSTALLATION SAVINGS. SORGEL dry-type transformers are so quiet that they can be installed in any convenient place inside of buildings, close to load centers. This results in shorter feeders, better voltage regulation, more efficient distribution, and lower wiring cost.

LIBERAL DESIGN, HIGH EFFICIENCY. SORGEL dry-type transformers are guaranteed to carry their full rated load continuously at high efficiency. They are so liberally designed that they can carry an overload during an emergency at a safe operating temperature. Vacuum impregnated windings brazed to solderless terminals assure years of trouble-free service.

TIME-TESTED. Nearly half a century of transformer development, engineering and manufacturing experience, have been incorporated in the design and construction of Sorgel transformers.

HIGHEST ENDORSEMENT. Sorgel Sound-Rated transformers have earned the highest endorsement of leading engineers and users.

Available in all standard and intermediate ratings. ¼ to 3000 Kva, and from 120 volts to 15,000 volts.

15 to 50 Kva 3-phase. Wall mounting. Connection compartment panel removed

SORGEL TRANSFORMERS

Sales engineers in principal cities.
Consult the classified section of your telephone directory or communicate with our factory.

Substations

The same quiet Sorgel transformers are also incorporated in substations. Procurable with any type or make of switchgear, or from any substation manufacturer.

3-phase versus 3 single phase

Save on installation cost by installing a Sorgel 3-phase unit instead of 3 single phase transformers. Available in 3 Kva to 3000 Kva, and all voltages up to 15,000 volts.

SORGEL ELECTRIC CO., 843 West National Ave., Milwaukee 4, Wisconsin

ATTENTION WASHINGTON!

D. C. citizen kills Mr. Entropy* — stops steam waste with SELECTOTHERM

Around the nation's capital, Gale Heslop, 1825 Jefferson Pl., N.W., is famed for eliminating steam waste in schools and other buildings where boilers are used for steam heating.

He does it with SELECTOTHERM, the high-vacuum heating system that automatically provides steam at the proper pressure and temperature for perfect comfort. Installation records show that SELECTOTHERM cuts the fuel bill 19% or more—*enough to pay for the system within five years!*

SELECTOTHERM applies the control directly to the boiler, adds to the effectiveness of the unit ventilators and individual room control. Get the whole story. If you're from the Washington area, call Gale at American Air Filter Company (DIstrict 7-8246). If not, write for fact-filled SELECTOTHERM booklet, *Boiler Room Ballad.*

**Mr. Entropy represents the heat that is produced but unavailable for use.*

SELECTOTHERM
HEATING CONTROL SYSTEM ®

A product of Illinois Engineering Co.
Division of American Air Filter Co., Inc.
2035 South Racine Ave., Chicago 8

engineers will pave the way for future mapping in Northwest Territories by running a line of precise levels to establish basic vertical control (heights of points above sea level) from the Saskatchewan-Northwest Territories boundary through to Coronation Gulf on the Arctic coast. Branch hydrographers will penetrate deep into Arctic waters on supply mission ships to chart safe routes for navigation, and the Department's new *Baffin*, especially designed for Arctic work, will chart Frobisher Bay on the southeastern coast of Baffin Island on her maiden Arctic tour.

The sum total of their season's work will be the completion of a shoran network of geodetic control over Canada's vast northern regions and the filling in of several gaps in the existing framework of control in more southerly areas; the field work for topographical mapping of more than 150,000 square miles of territory in various areas about the country; and the charting of hundreds of miles of coastal and inland waters for safety of shipping.

In terms of maps and charts, the season's work will mean over 200 new topographical maps, improved air navigation charts, and 12 new charts of coastal and inland waters.

Experimental Paper Mill

An experimental paper pulp factory, using vegetable products other than wood, soon will go into operation at Vivion-Beaumont in the Sarthe, France. The first material to be used will be the hemp plant. This plant, which grows abundantly in France, has been the subject of a thorough study by the paper laboratory at Grenoble, and has been found to make a good quality paper. The question remains as to whether existing machinery can be used for commercial production.

The four or five tons of pulp produced in the factory will be delivered to various paper manufacturers, who will then report on the practical utility of the pulp. If, as technicians have reason to hope, this new method proves successful, the Ministry of Agriculture will encourage new hemp cultivation in Flanders, Alsace, and Brittany. Other pulp sources to be tried in the experimental factory are sorghum and little pine shoots from the Landes district below Bordeaux.

Civil Engineering Standards

Conditions of a Standard Form of Contract for civil engineering construction open to international tender have been signed by Julian S. Tritton, for the International Federation of Consulting Engineers (FIDIC) and Norman Longley, for the International Federation of Building and Public Works (FIBTP).

Formal signing took place, after two years' joint discussion and negotiation, at a conference of the building federation.

The Conditions are designed to assist employing authorities and others responsible for carrying out development programs in dealings with both engineers and contractors. The procedure of the Court of Arbitration of the International Chamber of Commerce will be used for settlement of any disputes that may arise.

Tritton, president of FIDIC, was accompanied by vice president Georges Bory (France), and the immediate past president, Robert A. Naef (Switzerland). Also present were Senator Linsenhoff (Germany), Andre Borie (France), and Sir Andrew MacTaggart (Great Britain), all of whom took part in negotiations.

Membership of FIDIC includes the national consulting engineering associations of Belgium, Denmark, Finland, France, Germany, Great Britain, The Netherlands, Norway, Sweden, and Switzerland. FIBTP includes national building and civil engineering contracting organizations of these ten countries and of Argentina, Austria, Canada, Greece, Italy, and Luxembourg. ▲▲

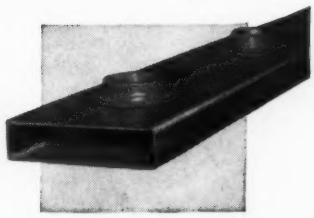
Pictured here is one of the first installations of a Walker No. 224 Combination Duct System. Building owner and General Contractor is the Standard Construction Co., 1000 Connecticut Ave., Washington, D. C. Electrical Contractor: Metropolitan Electric Co., Falls Church, Va. Electrical Engineers: General Engineering Associates, Washington, D. C. Electrical Distributor: Doubleday-Hill Electric Co.

Walker Announces New Large Capacity Combination Duct Systems

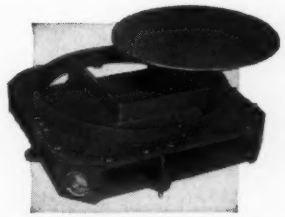
To meet today's increased use of telephone, intercom and signal service—and to provide room for future expansion—Walker has developed large capacity Combination Duct Systems. These systems use Walker No. 4 Duct in combination with Walker No. 2 Duct to afford the following range of wiring capacities:

CATALOG NUMBER	DESCRIPTION	TOTAL CROSS-SECTIONAL AREA
System #224	One No. 2 and One No. 4 Duct	12.0 sq. in.
System #3242	One No. 4 and Two No. 2 Ducts	15.3 sq. in.
System #3424	One No. 2 and Two No. 4 Ducts	20.8 sq. in.

NUMBER OF CONDUCTORS PERMITTED IN WALKER NO. 2 AND NO. 4 DUCT BY NATIONAL ELECTRICAL CODE		
CONDUCTOR SIZE (AWG)	WIRE TYPES: T, TW, RU, RUH, RUW	
	NUMBER OF CONDUCTORS IN NO. 2 DUCT	NUMBER OF CONDUCTORS IN NO. 4 DUCT
14	96	259
12	75	204
10	58	156
8	31	86
6	15	42
4	11	32
2	9	24
1	6	17
1/0	5	15



Walker No. 4 Duct has 8.75 sq. in. cross-sectional area compared to 3.31 sq. in. for No. 2 duct. No. 4 duct measures 6 ½" x 1 ½" and is doubly protected against corrosion.



Walker No. 224 Junction Box accommodates one No. 2 and one No. 4 duct. Straight passageway affords easy pulling of cable.

WALKER BROTHERS
Conshohocken, Pa.

Underfloor Electrical Distribution Systems
Rigid Steel Conduit—E.M.T.—Wire and Cable

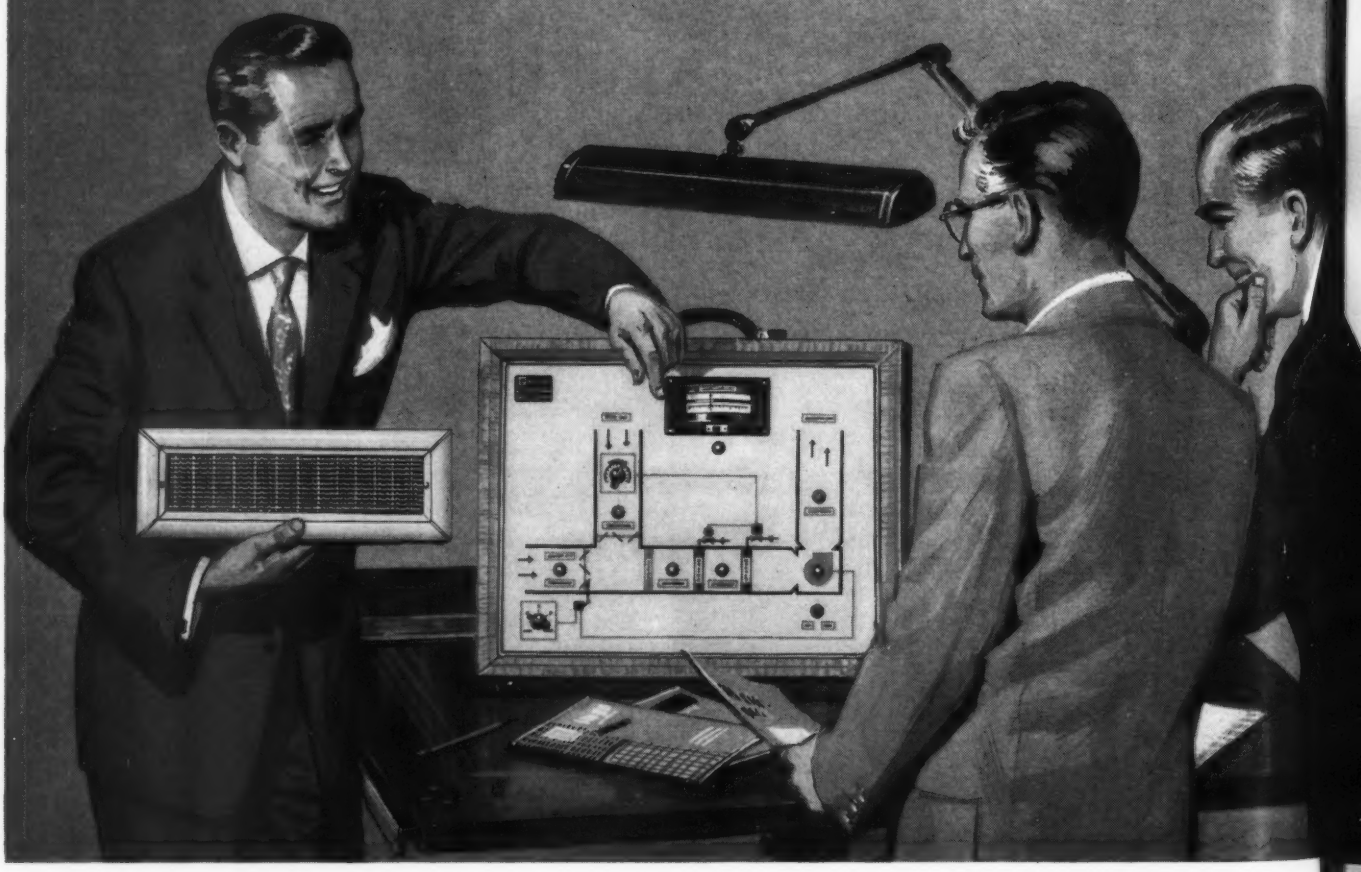
"Quality Our Tradition, Progress Our Ambition"

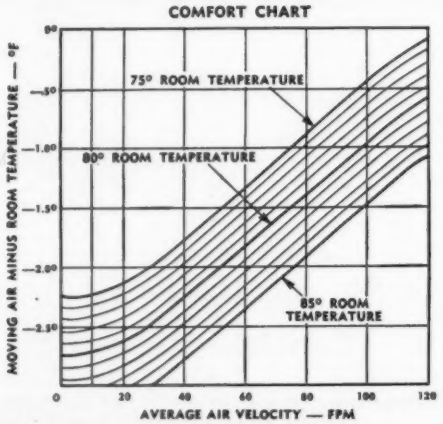
walker of Conshohocken

THE MARK OF QUALITY

BARBER COLMAN

one source
one responsibility. . . . . .





COMFORT STANDARDS

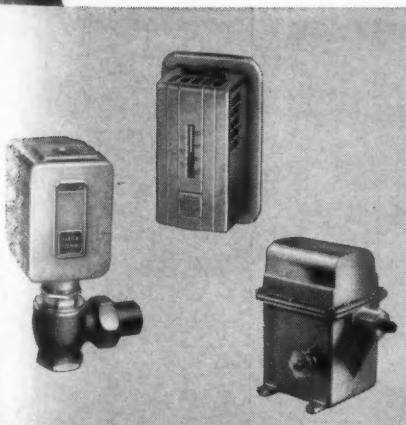
Barber-Colman engineers have developed a Comfort Chart illustrating the proper relationship between air velocities and air temperatures necessary for human comfort. This chart, shown at the left, serves as a criterion for rating the performance of Barber-Colman automatic control and air distribution products. It indicates conditions of air movement and temperature in the occupancy zone. The line shown for each average room temperature is the limit of satisfactory comfort conditions. All points below the line represent uncomfortable conditions while those above the line fulfill Human Comfort Standards. As the *one source* for *both* temperature control and air distribution products, the Barber-Colman man can assure the proper relationship of temperatures and velocities as dictated by this chart.

COMBINED PRODUCTS, COMBINED SKILLS . . . COME TO ONE SOURCE. . . .

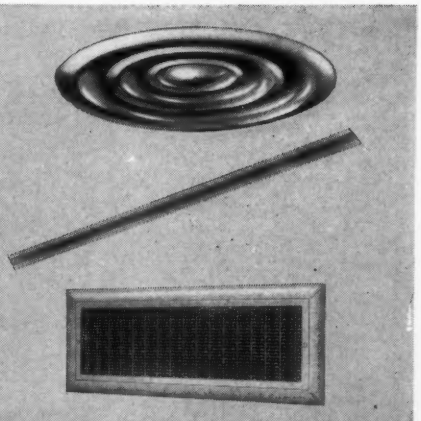
. . . for your Automatic Controls and Air Distribution Products

Yes, Barber-Colman is prepared to give you a combination of *both* temperature control and air distribution, selected and adjusted for ideal comfort! A complete line of superior-quality equipment, coupled with a nationwide field organization experienced in the selection and application of Automatic Control and Air Distribution equipment, is quickly and easily available. The Barber-Colman Sales Engineer assumes the responsibility for selection and placement of equipment and is available for supervision of installation and final balancing of the combination system. More and more of these system combinations are being furnished by Barber-Colman as the solution to problems resulting from an ever-changing architectural concept and the demand for higher comfort standards. Phone your nearby Barber-Colman field office for a discussion of how you can benefit from this highly logical trend.

This new fully illustrated bulletin details advantages of the complete temperature control and air distribution system combinations available through the one source and one responsibility of Barber-Colman. Write for your copy of Bulletin F8326.



Barber-Colman Electronic Automatic Controls and Uni-Flo Engineered Air Distribution Products are the result of extensive research, laboratory tests, and field experience. Accurate, comprehensive engineering data are available for each of these products. You may use them confidently.



BARBER-COLMAN COMPANY

Dept. V, 1660 Rock Street, Rockford, Illinois

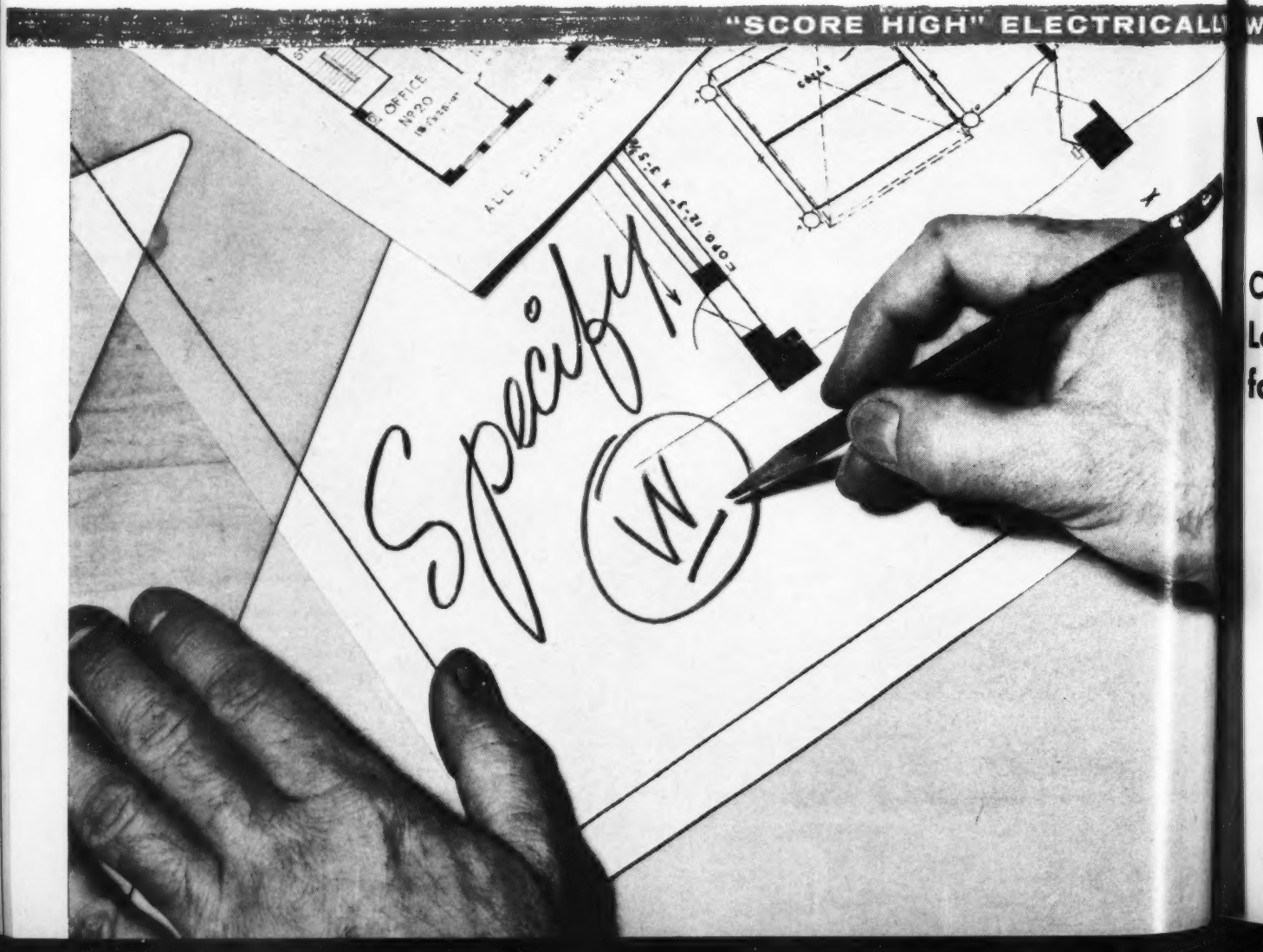
News for the Consultant

Computer Used for Traffic Analysis

The repetitious and time consuming work necessary on traffic analysis projects can be done not only more quickly but in more detail by the electronic computer than by the engineer according to an article in *The HNTB News,* house organ of Howard, Needles, Tammen & Bergendoff, Kansas City and New York.

The author, Ray C. Bergendoff, describes use of a computer at the firm for traffic analysis on the Milwaukee Expressway System, the Orlando Expressway, and the Cuyahoga County (Cleveland) Expressway System. The Orlando job consisted only of assigning traffic to the expressway, while the Milwaukee job required an analysis that updated a 1944 survey to 1980 and assigned the traffic to the system of eight major interchanges and sixty local service interchanges.

All the data necessary for computation of the Milwaukee project were punched into 22,000 Remington Rand cards. These cards were sorted and



passed through the computer. The computer, programmed for computing expansion factors, distributing traffic throughout the county, and assigning traffic to all interchanges, punched answers back into 150 cards per minute. Each report card then contained the data to define the origin and destination of an interzonal transfer in 1980, its volume, and its route over the expressway.

The cards then were tabulated on report sheets and summarized for volumes on each ramp and expressway section in order that lane requirements and weaving sections could be determined and ramp terminals designed.

The actual operation of the system involves several passes through the computer and many sorting operations. However, use of the machines made it possible to utilize theories not possible in manual methods because of time limitation.

The firm's ultimate aim is to eliminate up to 90 percent of the manual work through the use of electronic computers by giving the computer mathematical models of the expressway system and the survey area. From this information the computer will produce design volumes on any portion of the system. The Cuyahoga County Expressway analysis now in progress in the Cleveland and Kansas City offices of HNTB will permit the firm to study, test, and program one or more items in the development of this "ideal" analysis. In all this job will involve some 130,000 punch cards.

Mr. Bergendoff concludes from his experiences to date that "the application of the computer to traffic engineering appears to be virtually boundless, dependent only upon the imagination, ability, and curiosity of the researcher."

Insurance Offices Feature Open Baffled Ceilings

Almost four years to the day that its board of directors approved the site, Connecticut General Life Insurance Co. has moved into its ultra modern quarters on a 268-acre plot outside of Hartford, Conn. In addition to offices, the area includes a bowling alley, theater, game area, snack bar, cafeteria suspended over a reflecting pool, private dining rooms, card rooms, barber shop, beauty shop, service station, medical area, and bus service to Hartford.

Flexibility and space for future expansion were prime considerations in planning of the offices, which are laid out on 6- x 6-ft modules sub-divided with demountable partitions constructed of aluminum posts and intermediate framing members, partition

WITH WESTINGHOUSE

WHY

Consulting Engineers Look to Westinghouse for Effective "Backup"

On the chart of specifying influences maintained at Westinghouse the consulting engineer is listed in bold type.

That is why Westinghouse engineering specialists, located in every key area, consider it an important responsibility to be available at all times as assistants on your team planning electrical systems. They *are* engineers and they *are* specialists. They have at their fingertips the most complete selection of electrical apparatus. Every item is of advanced design because of Westinghouse research and development.

Thus, these men can save you time, bother and money in helping to select exactly the right apparatus to assure each of your clients a co-ordinated system that will be economically adequate for maximum needs . . . today *and* in the future.

More and more consulting engineers are proving that by writing "specify W" on instructions handed to detailers, they enjoy the most positive form of client insurance. DP-5040-1

Here's an example of a "Specify W" system and typical Westinghouse apparatus . . . . .

YOU CAN BE SURE...IF IT'S Westinghouse

INSET SHOWS FINISHED CEILING WITH EXPOSED AIR DUCT AND DIFFUSER, SPRINKLER, AND P.A. SPEAKER.

panels, and doors constructed of plastic laminate surfaced wood grid cores.

Two 22,900-v lines supply power. In case of the failure of both lines, a 750-kw generator can carry essential loads.

One of the most unusual features of the new headquarters building is the lighting. (See "Open Ceilings Give Better Light at Lower Cost," April 1956 CE). About half of the entire area uses the open baffled ceiling, developed for this project. The system is designed so that it not only produces and distributes light, but also corrects the acoustics of the space, affords anchoring points for the upper end of partition supports, and conceals from normal view sprinklers, air diffusers, and loud speakers. It does not employ a diffusing medium, but has exposed 6-ft tubes shielded by baffles. The tubes are only one-third as bright as ordinary tubes, thus reducing glare. The baffles and the ceiling are white so that the entire cavity becomes a huge reflector.

Before deciding on the baffled lights, 25 lighting schemes were tried in mock-ups in an experimental building on the site.

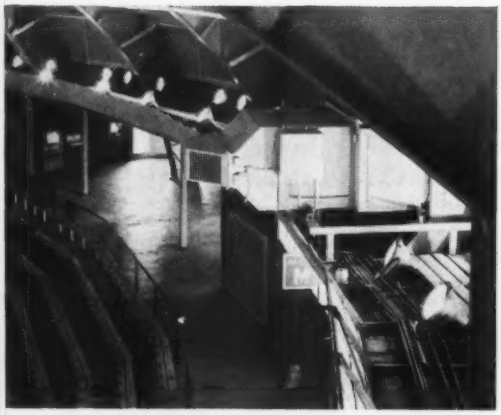
Cooling is provided by two refrigeration machines with capacity equal to the melting of 1600 tons of ice in 24 hours, and by the cool water drawn from 10 wells. The well water precools fresh outside air, condenses the gases in the refrigeration machines, and condenses the steam which supplies the power. The water is discharged into a four-acre pond south of the building.

The air conditioning is controlled from the engineer's office, where a panel shows temperature readings at more than 100 locations. The 100 fans change 1 million cubic feet of air per minute. The periphery system of heating or cooling by water

this planning team*

Scored high . . .

by SPECIFYING WESTINGHOUSE



Thousands of spectators will be thrilled by brilliant sports and pageantry in this beautiful new gym of the Alexander Memorial Physical Training Center at Georgia Institute of Technology in Atlanta. They will cheer athletes whose skills are at their peak, under light as "fast" as the game they play . . . with a high illumination level, free from glare or shadow.

Westinghouse lighting units are served by Westinghouse panels and control equipment, components of an all-Westinghouse electrical system. Read the details described on the following pages. DP-5004

Installation and wiring of the Westinghouse floodlights girding the circumference of the Alexander Memorial gym was simplified by the planning of this service balcony. It also provides convenient access for cleaning and lamp changes.

*Consulting Engineer — Charles F. Howe, Atlanta • Architect — Aeck & Associates, Atlanta • Electrical Contractor — Brooks Allison Co., Atlanta • Distributor — Electrical Wholesalers, Inc., Atlanta.

YOU CAN BE SURE...IF IT'S Westinghouse

and air has 1434 window units. A supplemental system of high velocity ceiling ducts delivers air to the interior areas.

Two cores contain mechanical elements — plumbing, heating, electrical equipment, space for conveyors, fire stairs, and rest rooms. The panelled outer walls conceal ventilated coat closets, pay telephones, and drinking fountains.

Syska & Hennessy were mechanical and electrical engineers on the project, with Skidmore, Owings & Merrill, architects.

Combined Efforts of Professions Kill Unfavorable Bill in Utah

United action of the licensed professions in Utah has been successful in defeating proposed legislation that would have weakened the licensing provisions of the state and possibly eliminated provisions for protection to the public, according to the *Registration Bulletin* of the National Council of State Boards of Engineering Examiners.

The proposed legislation was the result of a two-year study by the Utah Legislative Council on business and trade regulations. Proposed changes included addition of lay citizens on each board and establishment of a super-commission as the final licensing board and board of appeal.

The Utah Engineering Council, which had been incorporated in 1948 as a means of cooperative action for the engineering societies of the state, spearheaded joint action by all licensed professions in the state. As a result, the Utah Professional Council was organized from representatives of all licensed groups, from physicians and surgeons to certified public accountants.

Evidence presented by the UPC to the legislature not only killed the proposed legislation, but also brought about a new law defining a legislative policy for the state in determining the need for regulatory legislation relating to professions, trades, and occupations. The law states, in part, that:

"The right to engage in any lawful profession, trade or occupation is an inherent right and such right shall not be impaired through State regulation unless the interest of the people of the State generally, as distinguished from those of a particular class, require such regulation and State regulation is the most effective and equitable means of providing the necessary protection to the people of the State. It is further declared that the relative degree of hazard to the public health, safety, or welfare which may result from an un-

regulated profession, trade or occupation be supported by adequate experience and research.

Testing-Firing Stand Ready for Vanguard Rocket

Designed to withstand exhaust temperatures of 4000 F, tremendous shock and vibration, and extremely corrosive conditions, the testing and firing stand that will support the take-off of the earth satellite rocket will weigh and measure the thrusts of many captive Vanguard rockets before becoming the take-off platform for the first firing next year.

A model of the launching stand and the Vanguard rocket is on display at the Vanguard Computing Center in Washington, D.C. The Center, operated under a Navy contract by International Business Machines Corp., will compute the future orbits of the satellite.

The launching installation, consisting of an outer and inner structure of heavy steel, is anchored to a concrete base and is topped by the testing and flight firing stand. The firing stand is roughly cubical, measuring 6½ feet in each dimension.

Fully instrumented, the stand, in addition to holding the rocket exactly vertical, helps to support it under wind loads, weighs it and its liquid fuel while the rocket is being loaded, supports its first stage engine during captive runs, holds the engine during nozzle gimbaling, and measures its thrust.

During firings and flight release the stand performs the same weighing and supporting functions, and also disconnects simultaneously and automatically the fuel and instrument lines. More than twenty attachments for fuel and instruments must fall free instantly.

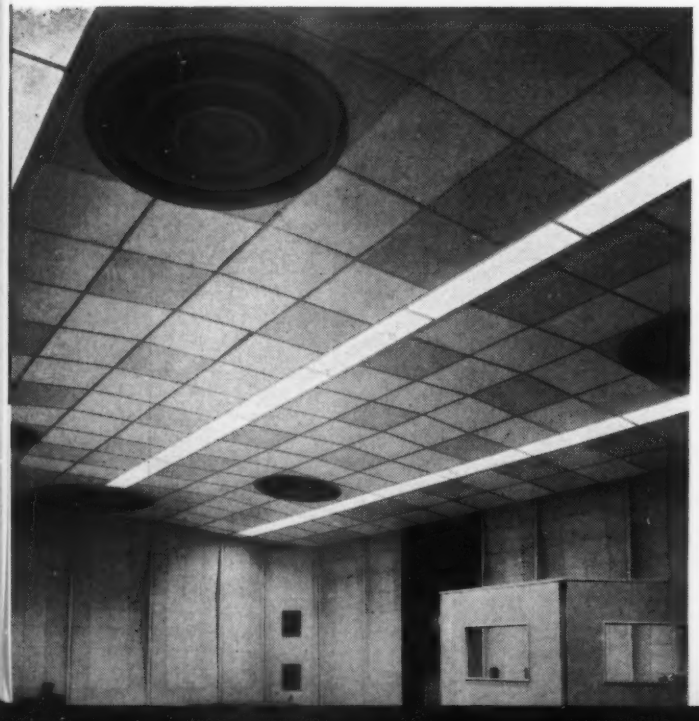
The base of the stand houses a large, curved flame deflector that is held in place by the inner structure and cooled by a high pressure water system. This deflector diverts the hot exhaust blasts from vertical to horizontal, quenches the flames of the exhaust, and releases steam.

The weighing-measuring equipment mounted on the stand was designed and built by the Electronics and Instrumentation Div. of Baldwin-Lima-Hamilton. The system, consisting of four SR-4 load cells, which support the rocket stand on a weigh ring, relays measurements of weight and thrust to a bank of recorders in a distant blockhouse.

In addition to its functional components, the stand is equipped with floodlights, emergency fog nozzles to put out fires, a safety shower, and emergency eye-wash fountains for the protection of personnel.

"SCORE HIGH" ELECTRICALL W

For Versatile, Efficient and F



Multiple-Use Parking Lot Under Construction in New Jersey

The parking area provided for a shopping center now under construction in Dover, N.J., has been designed to serve two purposes. The two-level structure will park 8500 automobiles by day, and after dark, when the stores are closed, the top level will serve as an outdoor drive-in theater.

Reinforced concrete girders will run the width of the parking deck, supported on 8-in. unfilled standard pipe columns spaced on 25.5-ft centers. The pipe column rows are laid out longitudinally so that two 17-ft 7-in. spaces alternate with a 23-ft 4-in. space. As a result, parking stalls on the lower level are approximately 17 feet deep and are served by a 23-ft driving aisle.

In construction of the upper level, wood forms for the concrete girders were built on the ground level between supporting columns, hoisted to the proper elevation with a fork lift truck, and held in position with temporary intermediate shores.

Floor joists — 12-in. Junior Beams weighing 11.8 lbs per linear ft — were placed on top of the girder forms. These beams, which project 3 inches into the concrete girders, are spaced 2 feet 3½ inches with wood dividers to complete the depth of the forms.

IN FOREGROUND CLIPS HOLD PLYWOOD FORMS IN PLACE.

After the Junior Beams were positioned, "K" clips were placed along the top flange of the beams to support 2-ft x 8-ft x ⅝-in. plywood floor slab forms. The plywood forms are stripped easily by fracturing the clips by a light blow with a hammer.

Prior to the monolithic pouring of slabs and girders, reinforcing bars were placed in the girder forms and steel mesh placed for the slabs. Thickness of the concrete slab is 2¼ inches. The upper deck was

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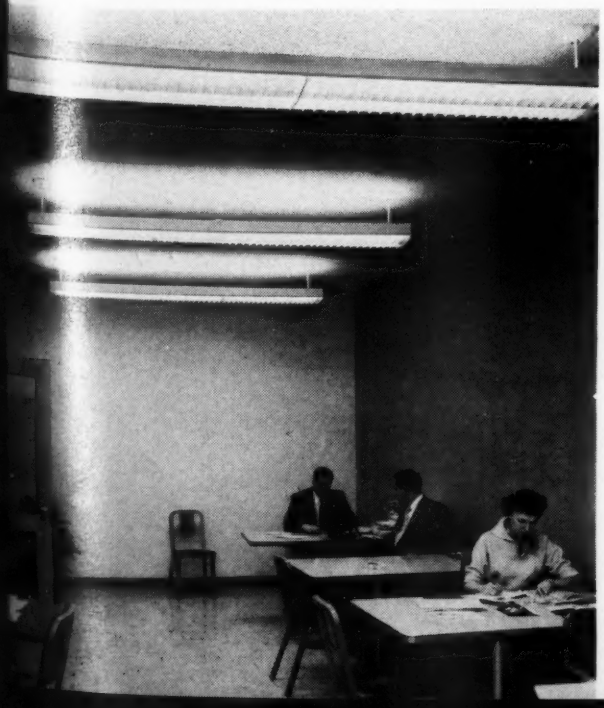
Functional Lighting . . . *SPECIFY WESTINGHOUSE*



There is a Westinghouse fixture for every lighting requirement. In the Alexander Memorial are examples of Westinghouse functional beauty and economy with efficient, lighting levels . . . all in harmony with the architectural décor.

At far left, recessed troffer units blend with unusual ceiling patterns in a radio sound studio; center, a gymnasium in the Memorial Building where Westinghouse high-bay units provide high-level, economical illumination; and the office scene demonstrates one application of Westinghouse LC fluorescent units for efficient, attractive lighting.

Ask your Westinghouse lighting specialist about complete Westinghouse line; in particular, the spectacular new Carousel units, available in two colors: sea-foam green and sun-tan brown.

DP-5040-3

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Westinghouse

built to support a live load of 75 lbs per sq. ft. This type of construction has been used to carry as much as a 300-lb-per-sq-ft live load.

The contractor estimated that use of lightweight Junior Beams, "K" clips, and the imbedding of the beams in the concrete girders, resulted in savings of up to $150,000. Junior Beams are a product of Jones & Laughlin Steel Corp.

Since the parking lot is built on a former lake area, a heavier loaded system might have presented problems in shoring and construction. The upper deck will extend about 10 feet over the man-made bank of the Rockaway River, which was re-routed to provide the site for the parking area.

Edward S. Klausner, New York City consulting engineer, designed the structure and also devised the cast iron "K" clips that were hooked over the top flange of the Junior Beams to support the plywood.

Advanced Techniques Presented in Seminars on Functional Drafting

The Industrial Education Institute, in cooperation with leading professional societies, trade associations, and industrial publications, is sponsoring a series of one-day seminars in major cities on advanced techniques in functional drafting. The seminars will be conducted by a panel of Westinghouse Electric Corp. experts who have developed, applied, and taught these techniques throughout their company.

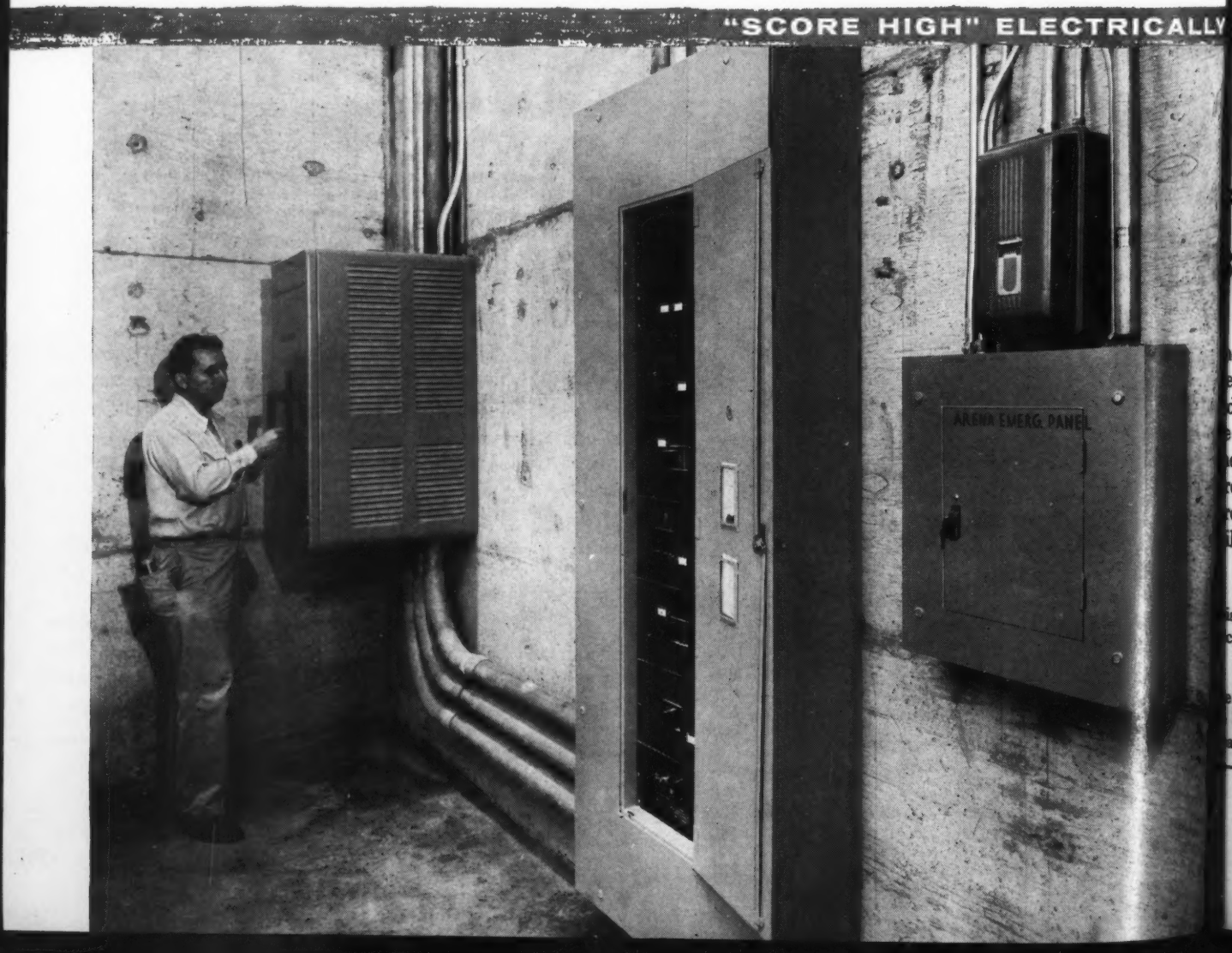
While the programs will include a brief review of practices that have proven of great value in actual use, the sessions primarily are designed to present other new and advanced techniques, methods, systems, and procedures.

An explanation of the origin, development, and advantages will be presented with each technique, followed by a demonstration and explanation of how each technique is being applied successfully.

Topics included in the program are:

¶ Organizing and applying a simplified drafting practices program.
¶ Successful application of advanced functional drafting techniques.
¶ Producing drawings photographically.
¶ Making printed circuit drawings.
¶ A system of identifying parts and drawings.
¶ Reducing storage space of old original tracings.
¶ The lineless diagram technique.
¶ Producing drawings by computer.

The seminar will be in New York City on Octo-



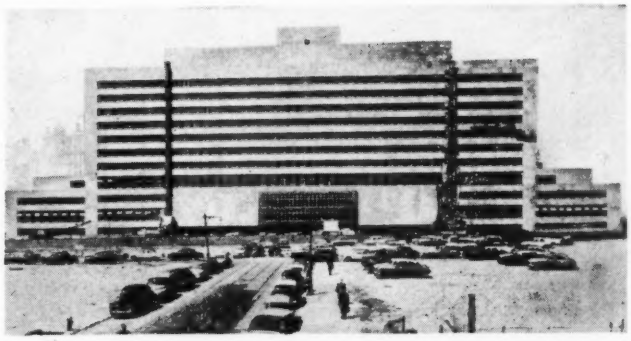
ber 2, and tentatively will conclude in Chicago on October 31. The registration fee, which includes all expenses during the day, is $35. Applications and additional information can be obtained from the Industrial Education Institute, 25 Huntington Avenue, Boston 16, Mass.

Courthouse Designed To Use High Voltage Distribution System

The Brooklyn Supreme Court, which is to be a major part of the new Brooklyn Civic Center, will be the first city building to use a 3-phase four-wire, 480-v line-to-line and 277-v line-to-neutral distribution system. The building will be completed next summer at a cost of almost $16 million.

Besides the high voltage distribution system, the courthouse will incorporate automatic operatorless high speed elevators, a double system of underfloor ducts to supply the necessary power for business machines and communication, drawout type breakers on the main switchboard, an emergency lighting system, and a juror's call system.

One of the features of the electrical installation is the utilization of drawout type breakers on the main switchboard. Mounted on a racking mechanism, these breakers can be easily disconnected and withdrawn from the switchboard structure. Since the cost of this type switchboard has become comparable to that of the stationary type, the City has been including it in the installation of all its larger buildings.



PROGRESS PHOTO SHOWS FRONT ALMOST COMPLETED.

Power from the transformer vault is split into two systems which may be connected at the main switchboard by the closing of a tie breaker. If one side short circuits, the tie breaker would be closed to supply most of the essential feeders.

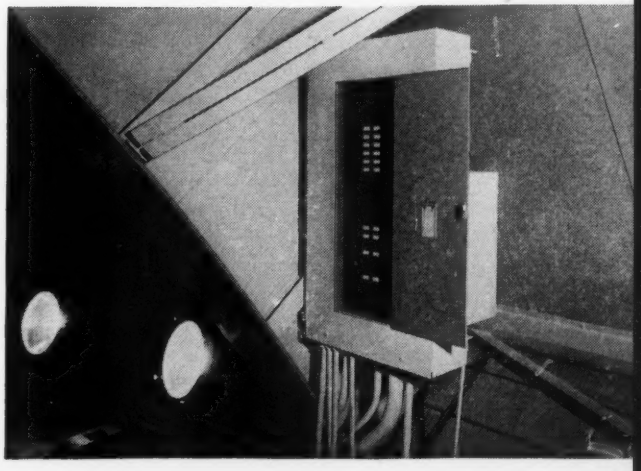
At the site of all elevator car lights, exit lights, and light outlets on the stairways, an emergency

LLY WITH WESTINGHOUSE

For Panelboards With Reliable Service Protection...

SPECIFY WESTINGHOUSE

e coordinated Westinghouse power distribution system in e Alexander Memorial insures protection of electrical services d provides for reliable power. Nerve centers of the system e the Westinghouse distribution and lighting panelboards. eir inherent ability to instantaneously stop power on dan-rous short circuits—yet allow harmless overloads to pass rough—provides the maximum in power continuity, reli-lity and protection. DP-5040-4



→

s Westinghouse Type NLAB lighting panelboard controls all of the cony and overhead floodlights for the Alexander Memorial gym.

e power panel and emergency lighting panel shown here are part of building's positive system protection through Westinghouse circuit aker panelboards.

YOU CAN BE SURE...IF IT'S Westinghouse

→

lighting system has been included. Uninterrupted service is made possible through an automatic transfer switch that transfers the load temporarily to an emergency feeder. When the difficulty has been located and repaired, power is drawn from the original source as the switch automatically returns to its normal position.

The cost of motor branch feeders and conduits has been reduced by the installation of motor control centers. One power feeder from the main switchboard, instead of a branch feeder for each motor, is all that is required. The motor control center consists of motor starters, each enclosed in a metal compartment and fed from a common bus.

The persistent mid-city nuisance — pigeons — is eliminated electrically. A bare 18-gage wire on the ledges above the north and south entrances is connected with a generator that delivers a pulsating current to discourage perching.

Electric Motors Favored Over Steam Turbines in Refineries

The petroleum refining industry is using an increasing proportion of electric motors as compared to steam turbines, according to Lee B. Eddy of the Universal Oil Products Co., Des Plaines, Ill., in a paper presented to the American Institute of Electrical Engineers' Conference of the Petroleum Industry. He predicted that as electric generating capacity and distribution systems become more reliable, electric motors will take over an even larger share of the work.

As a result of a detailed study of the factors determining the use of the proper driver, Eddy reached the following conclusions:

In locations where electric power supply is subject to frequent and lengthy outages, electric motors should not be used on any critical drives except where there is a steam turbine or other standby power available.

Where electric power supply is dependable and of reasonable cost, sufficient noncondensing turbines (preferably of the larger horsepower ratings) should be installed to provide all the low pressure steam requirements. These should include the drivers for any service requiring a variable speed input or for service where a momentary driver failure would result in extended plant shutdown for maintenance or clean out. All other small drivers should be electric motors.

Large drivers, which may be either motors or condensing turbines, should be selected on the basis

"SCORE HIGH" ELECTRICALL

For larger power requirements: Westinghouse switchgear, unit-built from standard components, simplifies installation, provides safe, sure control of distribution for any type of electrical system.

of a detailed economic study considering first cost, operating cost, and payout time.

J. M. Bryan of the Humble Oil & Refining Co., in his paper "Economic Justification for Corrosion-Resistant Electrical Materials," also stressed the importance of the electrical system in petrochemical plants for driving and controlling the machines. He listed five criteria that can be used to justify the economic use of the higher priced materials.

¶ Minimum allowable life expectancy of the completed installations.

¶ Need for continuous, uninterrupted service.

¶ Routine maintenance during useful life.

¶ Cost of ultimate replacement.

¶ Final salvage value of the materials.

He stated that there is no empirical formula that dictates choice of the electrical equipment for a refinery but that each project must be engineered according to individual needs and conditions.

Underground Parking Garage Monitored Automatically for CO

The block-square $4,100,000 Auditorium Plaza Garage, facing the Municipal Auditorium in downtown Kansas City, features a landscaped civic park

UNDER PARK IS A THREE-LEVEL PARKING GARAGE.

at the ground level, with three underground levels.

Two years in construction, the development is the result of a concerted effort on the part of Kansas City officials to alleviate the city's downtown parking problem. City officials L. P. Cookingham, city manager; Reed McKinley, director of public works; Stanley G. Palmer, city engineer; and Kenneth W. Fink, city architect, worked closely with Howarth, Scott and Kinney, mechanical and electrical engineers; Pfuhl and Shideler, structural engineers; and Gentry and Voskamp, the architects.

A total of 25,000 cubic yards of concrete and 1650 tons of reinforcing steel were used in the

WITH WESTINGHOUSE

SPECIFY WESTINGHOUSE . . .

for Flexible, Economical, Efficient Power Distribution

Modern industrial planning calls for both flexibility and economy in power distribution.

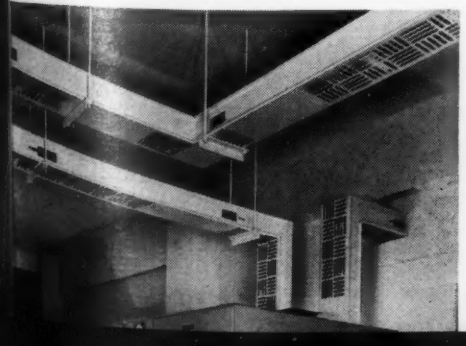
These qualities are inherent in Westinghouse Life-Line® bus-way design . . . with conventional bus duct or new Uni-bus. Most flexible of all bus distribution is Westinghouse Uni-bus, which does away with problems of close fitting, turns and troublesome obstacles.

Another outstanding advantage of Uni-bus is its inherent safety. Plug-in, power take-off devices can be completely installed and wired *before* live connections are made.

Ask your Westinghouse construction sales engineer for more information about flexible, economical, safe, Westinghouse bus-way systems. DP-5040-5

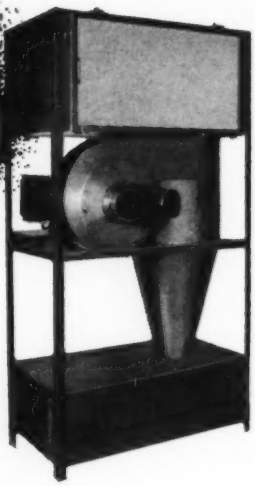
YOU CAN BE SURE...IF IT'S Westinghouse

Left: Typical installation of low-impedance bus duct. Center: Conventional plug-in bus duct with power take-off receptacles located every 12 inches for convenient power use. Right: New Uni-bus makes every job fit without difficulty. Wiremen are protected by safety interlock that keeps live bus covered until plug-in wiring is complete.



EFFICIENT–LOW COST

Dust Collection



Easy installation . . . efficient low-cost operation . . . simplified maintenance, make Dustkop *FIRST* among equipment to collect most all industrial dusts. There are Dustkop models to eliminate your dust problems . . . that are space saving, self-contained units; or exhaust type for rafter, ceiling or outside location. Write for descriptive literature.

DUSTKOP STOPS DUST

37 STANDARD MODELS TO CHOOSE FROM

• READY TO USE

Also a Complete Line of Mist Collectors

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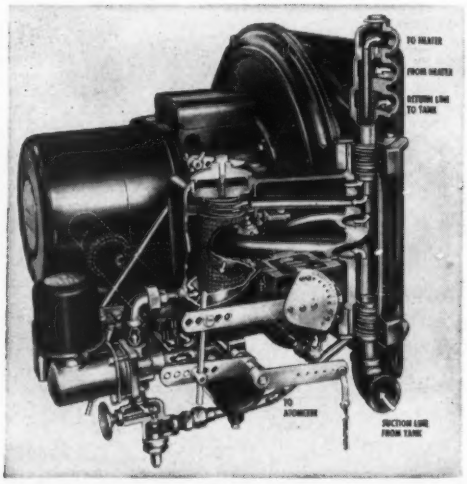
Model 53



For

SURER, SMOOTHER "COLD STARTS"

BETTER ALL-AROUND EFFICIENCY

This amazing new Johnson 53 virtually eliminates the problem of "Cold Starts" and varying Oil Viscosities. It's a masterpiece of advanced oil heat engineering. Metering Pump Control Quadrant provides calibrated reading of oil being burned. Make it a point to find out what it can do for you. There are 8 sizes from 25HP to 500HP with either Direct or Belt Drive. Combination Oil and Gas Models may be had. May we send you full details?

Johnson Oil Burners

S. T. JOHNSON CO.

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CHURCH ROAD, BRIDGEPORT, PA.

structure. An efficient ventilating system was necessary to prevent build-up of carbon monoxide in the underground levels. The system has seven fans of 75 hp and one of 100 hp. All are operated from a central control chamber. Nineteen individual carbon monoxide alarms, developed by Mine Safety Appliances Co., warn the attendant in the central control chamber of a build-up of carbon monoxide in the atmosphere within the garage. Continuous air samples are taken by the instruments mounted at breathing level.

Each air sample is heated, then passed through a detector cell which generates an electromotive force directly proportional to the carbon monoxide content of the sample.

As the concentration of the carbon monoxide reaches two parts per 10,000 for any section, the instrument activates a red warning light on the panel in the central control room. Each light on the panel indicates an area of the garage. If the CO content of any one section reaches the predetermined point, as indicated by the alarm, the attendant turns on ventilation as required.

City Planning Study Underway for Hartford

Preliminary steps toward modernization of the City of Hartford, Conn., have been taken with an allocation of $29,500 for initial planning cost. The Chicago firm, Real Estate Research Corp., will undertake a complete economic examination of the three major business areas involved. The Hartford Chamber of Commerce will pay $19,000 for the portion of the study aimed at the business areas.

A second portion of the survey, tentatively approved by the Hartford Redevelopment Agency, is a marketability and re-use survey of the Front-Market redevelopment areas, to cost $10,500.

The initial planning program breaks down into two parts. First, the Real Estate Research Corp. will conduct a study of the three districts involved to determine the best and highest use of land with respect to retail, commercial, professional, recreational, governmental, industrial, and possibly residential purposes.

Second, based on information gathered by the Chicago firm's study, either the city or a professional planning group will prepare a detailed plan for redevelopment, renewal, and modernization.

The detailed plan would include layout and integration of city streets, their integration with existing or proposed highway and expressway systems, parking facilities, civic buildings, and other facilities or changes which the development master plan would indicate.

The Redevelopment Agency also is awaiting a formal report from the New York real estate and

redevelopment firm, Webb & Knapp, Inc., proposing purchase of Hartford's Front-Market St. and Windsor St. redevelopment areas.

In an informal session with city officials, William Zeckendorf, head of Webb & Knapp, presented a four-point program for the areas:

¶ Enlarge the Front-Market St. project to include the State St.-American Row block and raise the grade of the area for use as a park-like plaza with subsurface, multiple-level parking for 1500 cars.

¶ Take over development of the Front-Lake-Market St. project and construct a giant commercial district in line with the city's redevelopment plans.

¶ Build low and moderate rental housing in the city's undeveloped North Meadows to provide for the 950 families to be displaced by the Windsor St. redevelopment project.

¶ Build high rise apartments and other high tax housing in the Windsor St. area to provide downtown business personnel with walk-to-work rentals.

Zeckendorf estimated that his firm could complete redevelopment in four to five years.

Computer Used to Study Air Traffic Problems

To determine the effect of changes in the route structure and rules of the control system on air traffic capacity, scientists at Armour Research Foundation of Illinois Institute of Technology are simulating flow of air traffic on an electronic digital computer. They are investigating air traffic control systems for use by commercial, private, and military operators in the common system of the continental U.S.

For purposes of the Foundation's investigation, the area surrounding New York, Washington, and in between has been selected. The initial portion of the program has been concerned with stipulated improvements in the present air traffic control system which can be made with presently available means, such as alteration of airway structure, rearrangement of navigation and communication facilities, revised procedure, and additional personnel.

The later portion of the program is concerned with system improvements resulting from the assumed use of facilities which normally might be expected or could be made available in 1965, such as a complete radar network in the United States and improved communications.

Currently, two simulation methods are being investigated — one using paper and pencil methods and the other using electronic digital computers. Methods of using an electronic digital computer for the systems analysis work are being developed as the study progresses. The complex procedure of air traffic control can be simulated in model form on the computer and accelerated to accumulate data more rapidly for analysis ▲▲

solves movement and temperature problems in curtain wall joints

Movement due to winds and temperature extremes pose a trying problem for designers of curtain wall buildings. The joint material must seal out water, dust and air but must remain flexible and resilient under these conditions. Hornflex, a thiokol formulation, provides a squeeze-stretch range of 325% and stays firm and elastic over a temperature range from *50°F BELOW ZERO to 250°F.*

Other uses for Hornflex are to fill and seal surface joints in bridges, highways, swimming pools, etc. Laboratory test and job applications indicate that Hornflex, properly installed, will provide excellent protection for periods up to *25 years and more.*

Like complete details? Write for Hornflex Technical Bulletin to Dept. ПЭО-10100.

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400 outside rooms with bath. Large-screen television and radio at no extra charge in every room. Air conditioning. Finest dining room.

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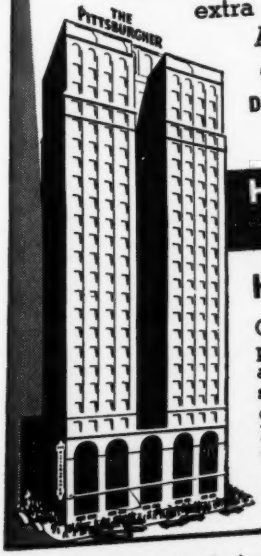


Handiest Locations in PITTSBURGH

Hotel Pittsburgher MOTEL

Opposite Greater Pittsburgh Airport on Airport Parkway west. 56 air-conditioned rooms with large-screen television at no extra charge. Tile bath. Private phone. Restaurant facilities. Courtesy car to and from airport.

AMherst 4-5152

●Teletype Service. For immediate confirmation of reservations at no charge . . . telephone any Knott Hotel—or teletype PG-29.

KNOTT HOTELS

Pinehurst

tees off on fuel costs

Golfing resort cuts costs 33%

with modern burning of coal

The central power plant at the famous golfing resort of Pinehurst, N. C., has to furnish a reliable supply of steam to three hotels and seven other buildings.

When Pinehurst recently decided to modernize power facilities, the consulting firm of Wiley and Wilson, Richmond, Va., was called in to study the situation. Since coal cost approximately 40% less than the nearest competitive fuel, the final decision called for burning coal the modern way. Today two new automatic stoker-fired boilers (only one of which is operated at a time) replace four 150-HP hand-fired boilers. Combustion control is automatic; coal and ash handling is greatly simplified. And now, according to management, "the cost of generating steam is 33.4% less than with the old plant."

Facts you should know about coal

Not only is bituminous coal the lowest-cost fuel in most industrial areas, but up-to-date coal burning equipment can give you 10% to 40% more steam per dollar. Today's automatic equipment can pare labor costs and eliminate smoke problems. And vast coal reserves plus mechanized production methods mean a constantly plentiful supply of coal at a stable price.

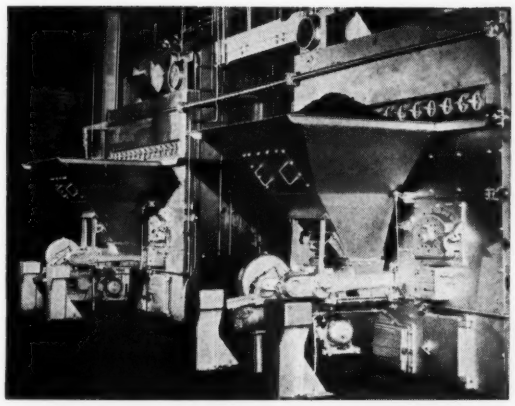
Technical advisory service

All companies planning a new power plant, or the remodeling of a present one, should consult an engineering firm on its design and construction. As a matter of fact, every Bituminous Coal Institute advertisement advises its readers to take this step. When you have such a project, our Engineering Staff will be glad to assist you in your fuel cost survey with any coal information you may require.

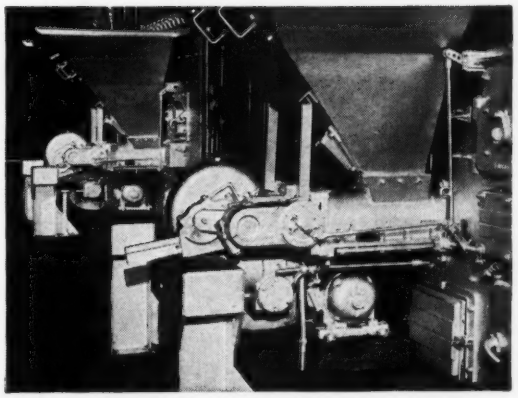
Meanwhile, we believe you will be interested in our informative case history booklet, complete with data sheets. Write to the address below for your copy.

BITUMINOUS COAL INSTITUTE

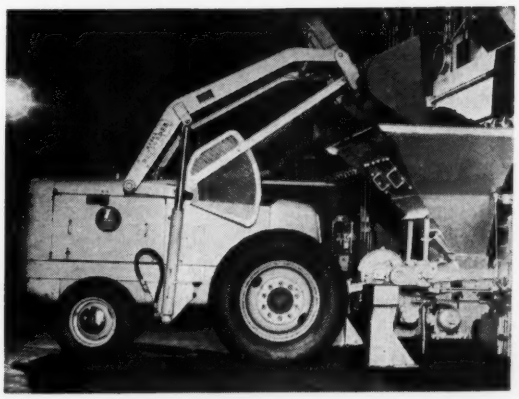
Southern Building • Washington 5, D.C.



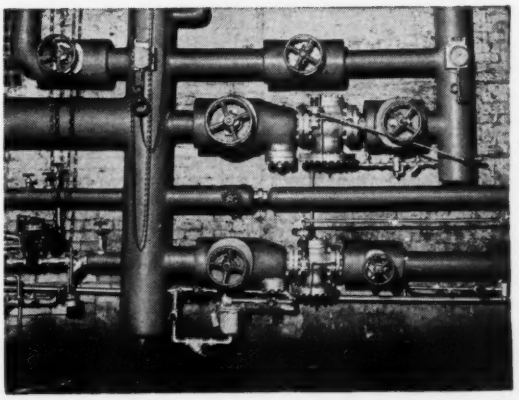
Two Babcock & Wilcox type FF integral-furnace boilers supply all the steam for Pinehurst at about 125 pounds pressure at 600° F. Average steam load is 11,000-12,000 pounds per hour per day.



Close-up of stokers. These underfeed, single retort, side-dump models are made by Detroit Stoker. They operate automatically, each driven by a 3 HP enclosed motor.



Frank G. Hough Payloader transfers coal from railroad trestle to storage, from storage to stokers. Payloader also facilitates handling of ash disposal.



Readily accessible, all of the steam distribution lines are taken off a manifold in the engine room. Five separate lines with Ruggles-Klingemann automatic pressure regulators distribute the steam at the required pressure in each case.

HOW TO GET AROUND TIME and COST FACTORS

in Protecting Pipe Against Corrosion

When you are faced with the problem of protecting piping underground in highly corrosive soils, a high quality coal tar coating such as called for in AWWA Specifications C-203 and C-204 is normally hot applied at a pipe coating mill. However, in many cases, the volume of pipe does not warrant this expense or the coating mill is too far away to justify the time involved.

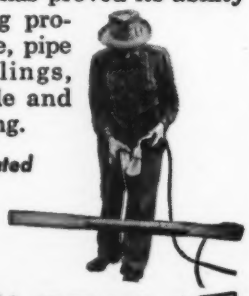
That's WHEN Engineers Specify TAPECOAT®

. . . the practical alternate hot-applied coal tar coating in handy tape form

Because TAPECOAT provides a coal tar coating equivalent in long-life protection to hot-applied coating at the mill, engineers are specifying this quality alternate material where time and cost factors preclude mill application.

This practical solution assures the protection required without the need for tar kettles, technical know-how and special crews. Field application costs are reduced because TAPECOAT is so easy to apply, using a torch to soften or bleed the pitch and then spirally wrapping it on the vulnerable surface.

TAPECOAT comes in handy rolls of 2", 3", 4", 6", 18" and 24" widths. Since 1941, it has proved its ability to give lasting protection to pipe, pipe joints, couplings, conduit, cable and insulated piping.



Write for illustrated brochure.

The TAPECOAT *Company*

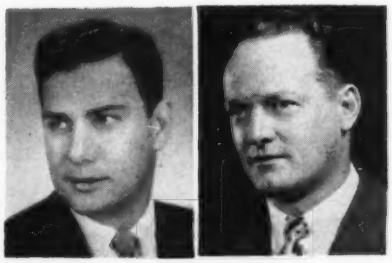
Originators of Coal Tar Coating in Tape Form

1569 Lyons Street
Evanston, Illinois

Men in Engineering

Donald A. Quarles, Deputy Secretary of Defense, will be presented the Award of Merit at the American Institute of Consulting Engineers' Annual Dinner October 15 at the Waldorf-Astoria Hotel, New York City. The speaker will be Raymond A. Wheeler, a member of the United Nations Suez Canal Clearance Group, and now with the International Bank for Reconstruction and Development, Washington, D.C.

Vernon Zurick has been appointed manager of the recently opened San Francisco office of Charles W. Lerch & Associates, consulting elevator engineers. Offices are in the Russ Building.



ZURICK MULLEN

Burns and Roe, Inc., New York, has divided the responsibility of chief mechanical engineer into two positions. Thomas Y. Mullen joins the company as chief mechanical engineer for power projects and Martin A. Mayers assumes the new position of chief mechanical engineer for special projects.

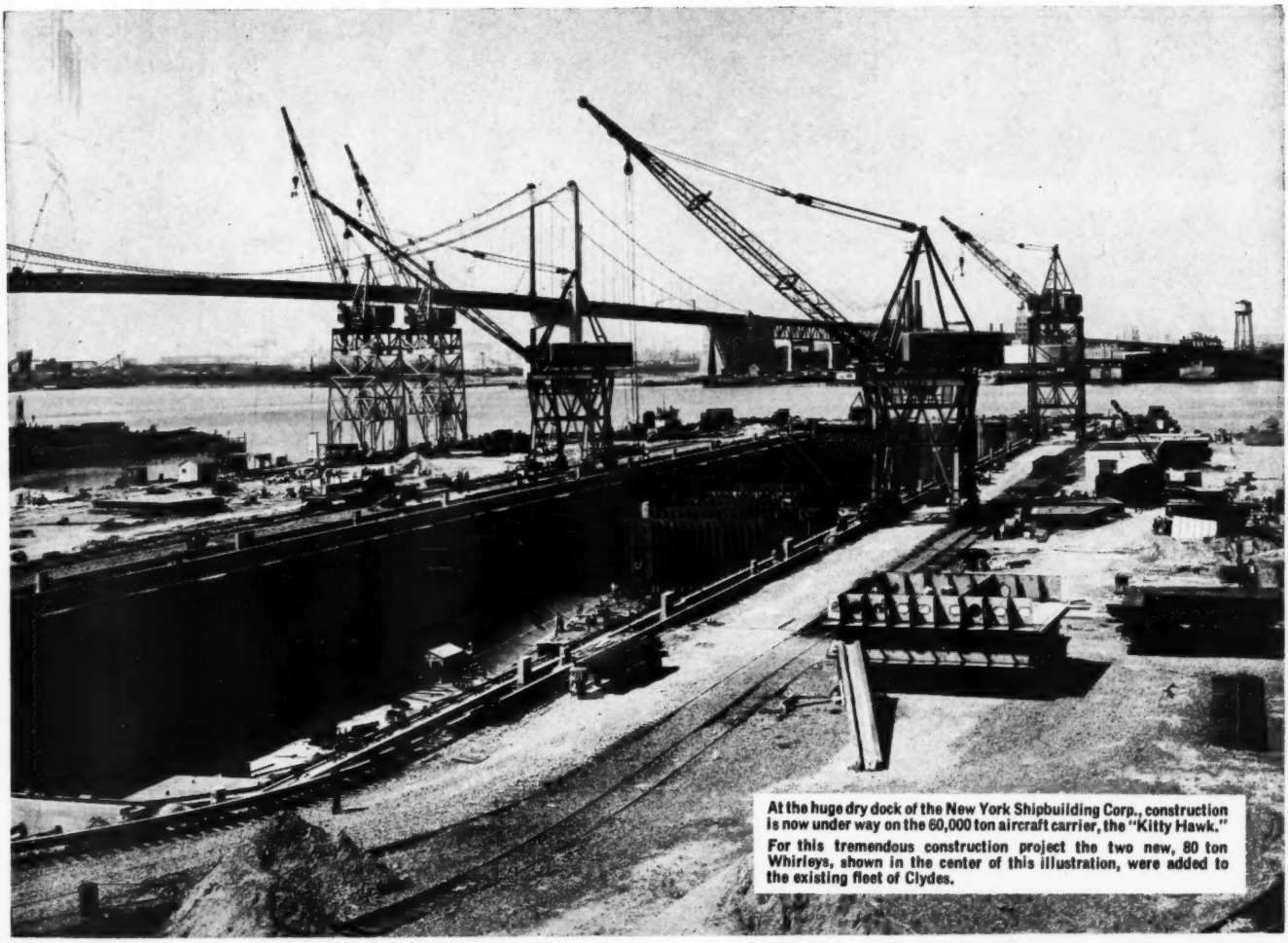
The Suez Canal Company has presented Ebasco Services, Inc. with the Count Ferdinand de Lesseps Medal as a memento of Ebasco's association with the Canal Company in connection with the recently completed economic study of the Canal. The study was conducted under the direction of Ebasco's Robert S. Quig, Rate Department Manager, and John M. Mitchell, Economic Consultant, Corporate Finance Dept.

New members of the San Francisco office of Ebasco are Curtis T. Atkisson, systems and methods consultant; George J. Neumayer, industrial relations consultant; Harvey A. Sartorius, industrial relations consultant; and Edward G. Welch, space planning consultant.

B. J. Kirkwood has been made a partner in A. C. Kirkwood & Associates, Kansas City, Mo. Before joining the Kirkwood firm in 1954, he was an industrial engineer and buyer for R. R. Donnelley & Sons, Chicago.

Leland S. Rosener, Jr., Engineers, have become Rosener Engineering, Inc., Engineers and Architects. The firm will maintain the same key personnel with offices at 149 New Montgomery St., San Francisco.

Haarstick Lundgren and Associates, Inc., St. Paul, Minn., have opened an office in San Francisco to serve clients in the western part of the United States. Robert



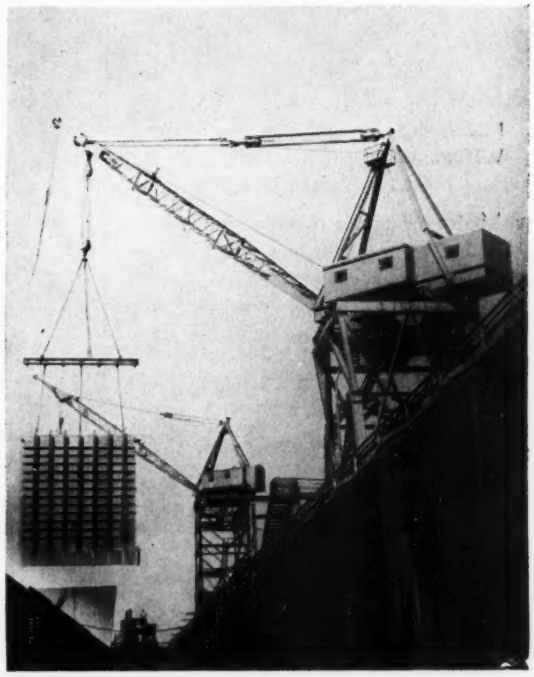
At the huge dry dock of the New York Shipbuilding Corp., construction is now under way on the 60,000 ton aircraft carrier, the "Kitty Hawk." For this tremendous construction project the two new, 80 ton Whirleys, shown in the center of this illustration, were added to the existing fleet of Clydes.

$120,000,000 construction project uses five Clyde Whirleys

With a four acre flight deck one-fifth of a mile long and an overall height equal to a twenty-five story building, this $120,000,000 construction project requires a tremendous amount of material handling know-how. Placing 52,000 tons of structural steel, 1,000 tons of aluminum, 180 miles of piping, 290 miles of cable . . . keeping materials moving on schedule . . . this is the assignment handed the five Clyde Whirleys by New York Ship.

Clyde's full revolving, self-propelled Whirleys have an established reputation of easiest, safest handling . . . equal load distribution on the fully supported turntable . . . a work-capacity that knows no equal! That's why Clyde Whirleys are preferred on major construction projects, at rail transfer terminals, for extra heavy cargo handling at leading ports around the world.

Whatever your material handling problems, it will pay you well to investigate the complete line of Clyde's *performance-proved* Whirleys, Hoists, Derricks, Whirlettes, Car Pullers, Unloaders, and deck and dock material handling equipment. The use of Clyde's Engineering Department is yours without obligation.



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LO-BOY
CENTRIFUGAL
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Enhance The Beauty Of Building Skylines

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Lowest Silhouette Design

FORWARD OR BACKWARD CURVE WHEEL WITHIN . . . . OR OUT OF SCROLL HOUSING

Motor mounting on side of structure support . . . out of line of air stream reduces height of Lo-Boy models nearly 50% of older designs.

LOW WIND RESISTANCE SIZES 10"-72"
600-47,000 CERTIFIED C.F.M. RATINGS

- **QUALITY**
- **BEAUTY**
- **PROVEN PERFORMANCE**

See Sweet's File 20c/Amm or Write for bulletin CE100 57

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MEMBER OF THE AIR MOVING & CONDITIONING ASSN.

A. Bennighof, Associate, will be in charge of the western operation, to be located in the Pacific National Bank Building.

The American Society of Mechanical Engineers has elected four engineer members as Fellows of the Society. They are: Ray N. Benjamin, vice president and chief engineer of Georgia Power Company; Carey H. Brown, a former member of the Hoover Commission Board on Water Resources and Power, and chairman of Engineers Joint Council Task Committee on Navigation and Inland Water Transportation; George M. Muschamp, vice president in charge of engineering at Minneapolis-Honeywell Regulator Co.; and Thomas F. Perkinson, manager of transportation for General Electric, Schenectady.

Fred W. Argue, vice president and engineering manager, and Edward J. Ford, vice president and senior construction manager of Stone & Webster Engineering Corp., have been elected directors of the firm. Argue is stationed at the Boston office and Ford at the New York office.

ARGUE FORD

Theodore E. Casselman Jr. has been appointed chief chemical engineer of S&W. He formerly was a senior project engineer.

Brigadier General Robert G. Lovett, U.S.A., ret., has been appointed manager of the new Kingston, Jamaica, office of Rader and Associates, Miami, Fla. Since his retirement from the Corps of Engineers in 1954, General Lovett has been an executive with the Rader firm, in charge of the departments handling ports and waterways, and engineering economics.

Tippetts - Abbett - McCarthy - Stratton, Consulting Engineers, New York City, have announced admission of Walther Prokosch and Barnett Silveston as general partners and Eugene E. Halmos and Wilson V. Binger as associate partners.

Western Engineers, Inc., Salt Lake City, Utah, a recently organized affiliate company of Engineering Service Corp., Los Angeles, will be headed by Henry C. Helland, formerly deputy state highway engineer of Montana. Permanent administrative offices are in the Greyhound Terminal Building, Salt Lake City.

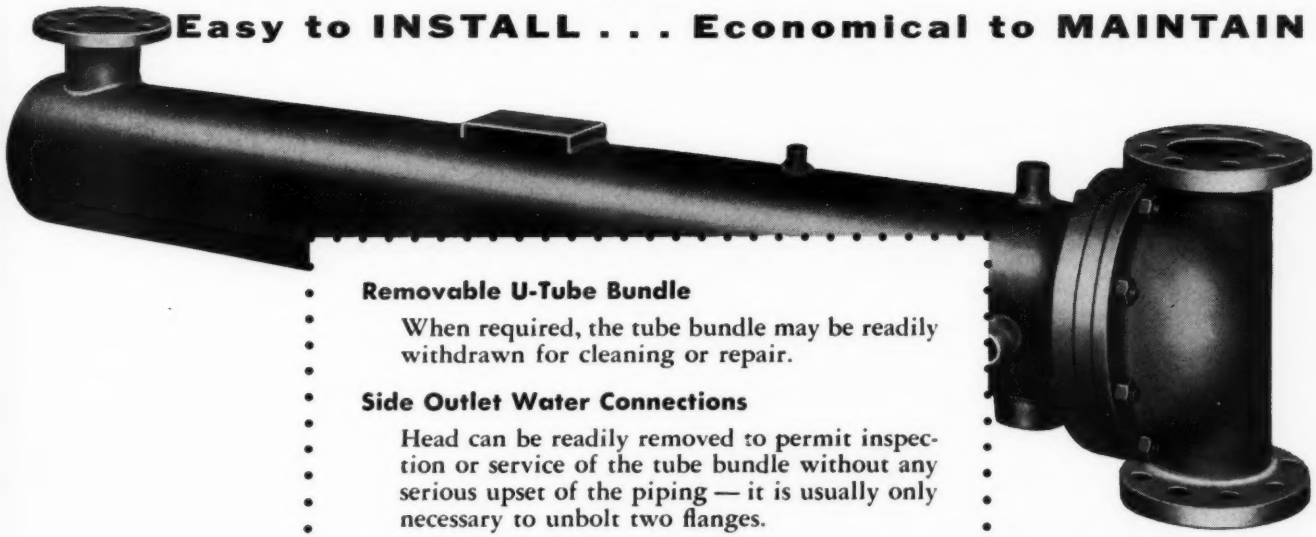
HELLAND LIVINGSTONE

James R. Livingstone, specialist in hospital planning and design, has left for South Korea to head three projects for the Detroit architectural-engineering firm of Smith, Hinchman and Grylls Associates, Inc. SH&G will prepare a master plan for growth of the University of Yonsei; a similar plan for the Presbyterian Seminary in Seoul; and the programming preparatory to design of a large medical science building for the University.

New officers of the Canadian Council of Professional Engineers are: president, Clifford N. Murray, general superintendent of Dominion Steel Coal Corp. Ltd., Sydney, Nova Scotia; vice president, Prof. W. O. Richmond, head of the department of mechanical

Whitlock CONVERTORS

Easy to INSTALL . . . Economical to MAINTAIN



Removable U-Tube Bundle

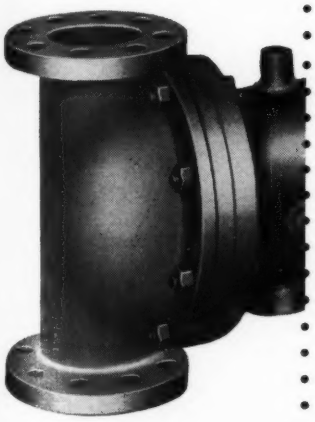
When required, the tube bundle may be readily withdrawn for cleaning or repair.

Side Outlet Water Connections

Head can be readily removed to permit inspection or service of the tube bundle without any serious upset of the piping — it is usually only necessary to unbolt two flanges.

Large Connections Flanged

Water connections when 5″ and larger are *flanged* as are also all steam connections 4″ and larger — extremely helpful in the field.



Whitlock Type R Convertors

include in their design many details requested by consulting engineers: They have long been the choice as the most satisfactory, economical and durable equipment for convertor service. Used for space heating systems in all types of buildings, they furnish hot water with minimum pressure drop. Promptly available in an extensive range of standard sizes, and at low cost.

Bulletin 62 is a handy reference book to help you select and specify Convertors. Provides complete information . . . including installation data. Ask for your copy.

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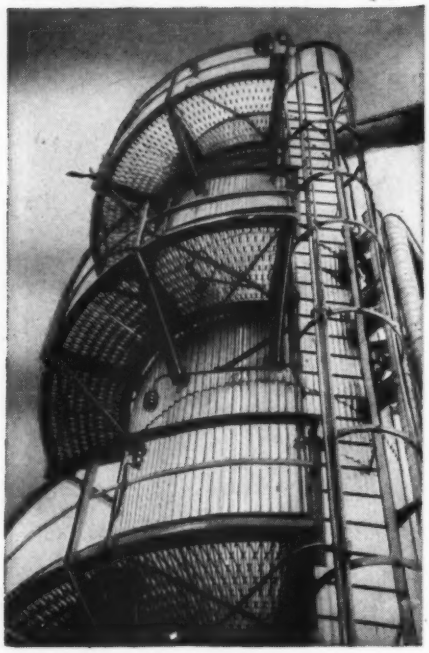
Instantaneous Heaters • Storage Heaters • Fuel Oil Heaters • Water Chillers

RAIN OR SNOW CAN MAKE CATWALKS DANGEROUS



Walkways, catwalks and treads made of solid wood, metal or other material can collect snow, rainfall, grease or oil and become dangerously slippery.

But these walking surfaces, made of an open mesh of metal bars on edge, cannot collect these substances, leaving the surface always *clean*, dry and tractional for safer access to high places.

As founders of the grating industry, the Irving Company can draw upon over half a century of experience to supply you with quality grating products for catwalks, treads and other practical and economical uses.

"A FITTING GRATING FOR EVERY PURPOSE"

Write for our General Grating Catalog.

IRVICO

IRVING SUBWAY GRATING CO., Inc.
Originators of the Grating Industry

Offices and Plants at
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1856 10th St., OAKLAND 23, CALIFORNIA

engineering of the University of British Columbia, Vancouver, B.C.; executive member, N. S. Bubbis, general manager, Greater Winnipeg Water and Sanitary District, Winnipeg, Manitoba. J. Murray Muir, Toronto, Ontario, continues as secretary-treasurer pending appointment of a permanent incumbent.

E. G. Bailey, former president of ASME and a vice president of Babcock and Wilcox until his retirement, has been made an Honorary Member of the American Society of Mechanical Engineers.

Robert Snyder, consulting engineer of Minneapolis, Minn., has opened new offices at 1645 Hennepin Ave. In the same office is Donald V. Knapp, who is conducting his own practice as an electrical engineer.

SCOTT TURNER

Scott Turner, past president of the American Institute of Consulting Engineers and the American Institute of Mining, Metallurgical and Petroleum Engineers, is the recipient of the 1957 Hoover Gold Medal. Awarded annually to an engineer for distinguished public service, the Medal is a joint award of the ASCE, AIME, ASME, and AIEE. Presentation will be in New York in February at AIME's Annual Meeting. Turner is next to Herbert Hoover in seniority as a past president of AIME.

The North Dakota Association of Consulting Engineers has changed its name to the North Dakota Consulting Engineers Council to avoid confusion with the association of county engineers in the state.

New officers for the 1957-58 year are: president, Ken Tompt, Fargo; vice president, Lewie Veigel, Dickinson; and secretary-treasurer, Willard Webster, Williston. Members of the board of directors are John Klingenberg and Don Floan. National directors (to CEC) are George Toman, principal, and R. W. Carlson, alternate.

Two California firms whose principals are members of the Consulting Engineers Association of California have their own offices under construction. Ralph M. Westcott, of Holladay & Westcott, Los Angeles, CEAC president, has under construction a building to house his own firm and provide rental space for other professional occupants. Simson & Stratta, structural engineers of San Francisco, expect to move into their newly erected quarters this month.

John F. Brennan and Robert T. Lawson, chief engineers in the New York and San Francisco offices, respectively, of Dames & Moore, and Warren D. Curtis, engineer in charge of the Salt Lake City office, have been admitted to partnership in the firm.

T. Keith Lagare has retired as secretary of the South Carolina State Board of Engineering Examiners. He served continuously as secretary and member of the Board for 35 years. He continues as a vice chairman of and consultant to the Board. At its annual meeting, the South Carolina Society of Professional Engineers presented Legare with its first "Engineer of the Year" award and made him a Life Member.

A NEW IDEA IN POWER DISTRIBUTION

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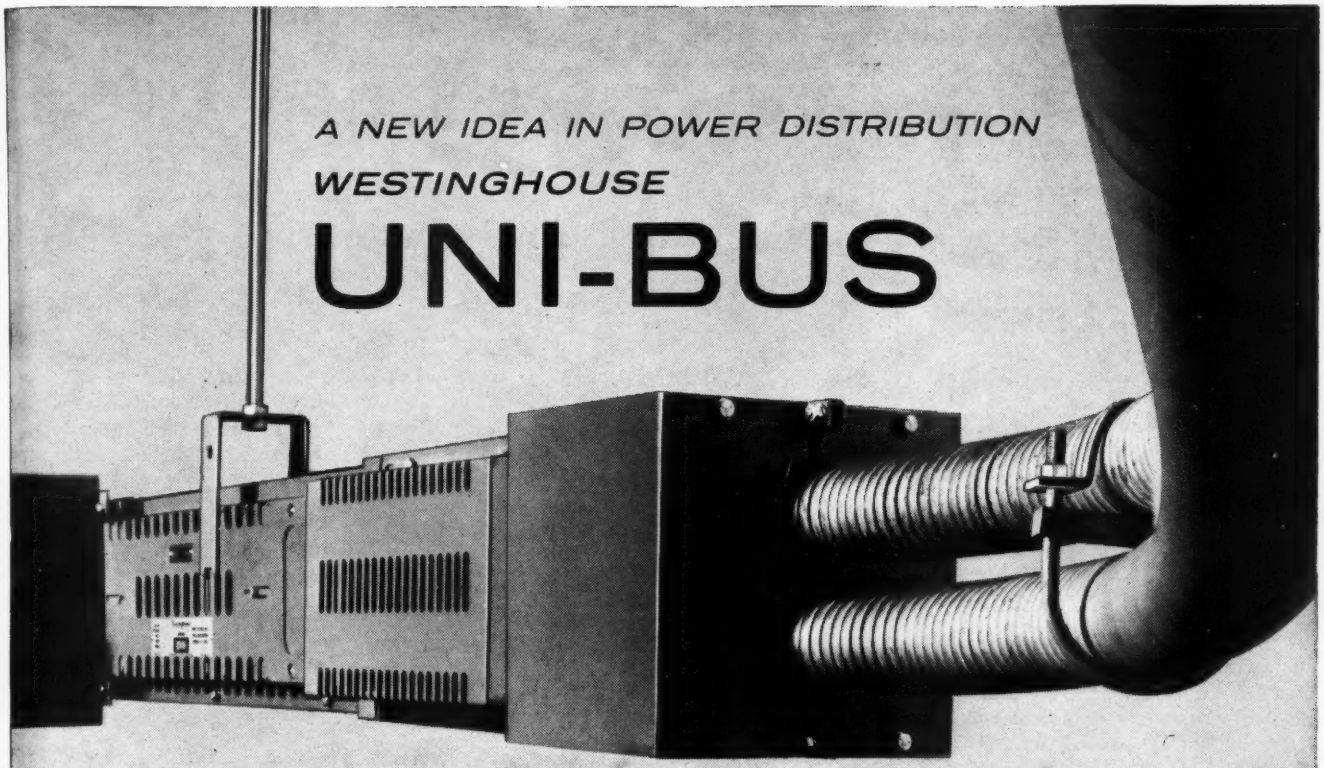

better because it's downright easy to use...

No busway is easier to use than new Westinghouse Uni-bus. One reason is the exclusive flexible connector that does away with all special fittings. And it simplifies layout and installation because no exacting field measuring is required.

One more reason Uni-bus is your best buy is the clip-on hangers which literally snap into place. And Uni-bus is lighter than any other busway.

Uni-bus is absolutely safe to use. It is impossible for personnel to touch live parts through plug-in openings. For more information, call your Westinghouse distributor, or write for booklet, B-7015, Westinghouse Electric Corporation, P. O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania. J-30238

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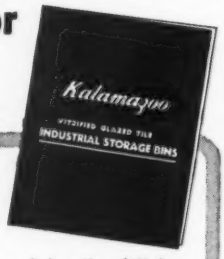
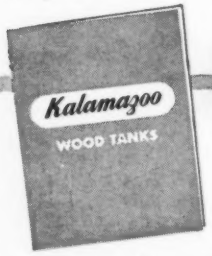
PLUG-IN LOW-IMPEDANCE BUSWAY

Kalamazoo offers 3 bulletins to help you plan STORAGE BINS, TANKS, CHESTS for Bulk Materials in Process or Storage



1

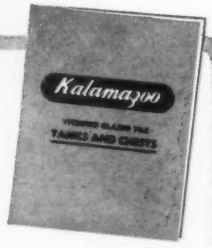
Shows cross sections and details of Kalamazoo Industrial Storage Bin construction plus advantages of maintenance-free Kalamazoo Vitrified Glazed Tile. Application photos.



2

Eight pages describing round and rectangular Wood Tanks, Special Vats, Flumes, Ducts and Frost-Proof Wood Boxing, used in processing and bulk storage. Construction details, numerous examples.

3



Illustrates Kalamazoo Split Tile and Unit Tile for straight or curved tanks and chests. Also Tile Lining for old or new tanks, pits. Applications shown.

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Kalamazoo | TANK & SILO CO.

New Projects Reported

By Consulting Engineers—

ARIZONA

Williams-Hastain Engineers.
Phoenix, Arizona.
Survey and preparation of plans and specifications for 5½ miles each of trunk sewers on Seventh Avenue and Seventh Street, Phoenix, Ariz., total length, 11 miles. (civil) $460,000. Client, City of Phoenix, Ariz.

CALIFORNIA

Austin, Field and Fry.
Los Angeles, California.
12-story home office building, Hollywood, Calif. Client, Federal Savings and Loan Association of Hollywood.

J. S. Hamel, Engineer.
Burbank, California.
Rocketdyne office building and factory expansion, Canoga Park, Calif. Air conditioned office building. (mech. elec.) $2,500,000. Client Kenneth H. Neptune, Arch.

Los Angeles, Calif. International Airport. (mech., elec.) $25,000,000. Joint venture with Pereira & Luckman, Welton Becket & Assoc., and Paul R. Williams, Arch.

Graduate School of Business Administration, University of California, Los Angeles. Business administration building. (mech., elec.) $4,000,000. Client, Risley & Gould.

The Fluor Corporation, Ltd.
Los Angeles, California.
Design, engineer, and supervise construction of 44,000-kw steam electric generating plant. $7,000,000 (est.) Client, City of Burbank, Calif.

James W. Wisda, Jr., Consulting Engineer.
Los Angeles, California.
Single-story, tilt-up concrete building, 20,000-sq-ft, dock-high floor, meeting rail cars in rear and trucks in front. Vernon, Calif. $200,000. Client, River Realty Corp.

Factory and office building, two-story, tilt-up concrete, adjoins sheet metal building at rear, Montebello, Calif. $375,000. Client, Trojan Machine Works.

The E-L-E Company.
Los Angeles, California.
North American Aviation, Inc. (mech., elec.) $6,300,000. Client, Woodford & Bernhard.

Porter Junior High School buildings. (mech., elec.) $1,400,000. Client, Rowland H. Crawford.

Santa Terrisita Hospital. (elec.) $650,000. Client, George J. Adams.

San Pedro Community Hospital. (mech., elec.) $1,200,000. Client, project architects.

Canoga Park Junior High School. (mech., elec.) $1,250,000. Client, Woodford & Bernard.

CONNECTICUT

Parsons, Brinckerhoff, Hall & Macdonald.
New York, New York.
Contract drawings and specifications for 16-in. pressure discharge line, extending from firm's parking lot to storm sewer on opposite side of adjacent Connecticut Turnpike. Client, Raybestos Div., Raybestos-Manhattan, Inc., Stratford, Conn.

DELAWARE

Lev Zetlin, Consulting Engineer.
New York, New York.
St. James Hospital, Dela. (struc.) $10,000. Client, Helge Westermann.

DISTRICT OF COLUMBIA

Penniman & Browne, Inc.
Baltimore, Maryland.
Subsurface exploration at Sherrill Drive and Piney Branch, Rock Creek Park, Washington, D. C. (civil) Client, National Capital Parks Commission and Michael Baker, Jr., Inc.

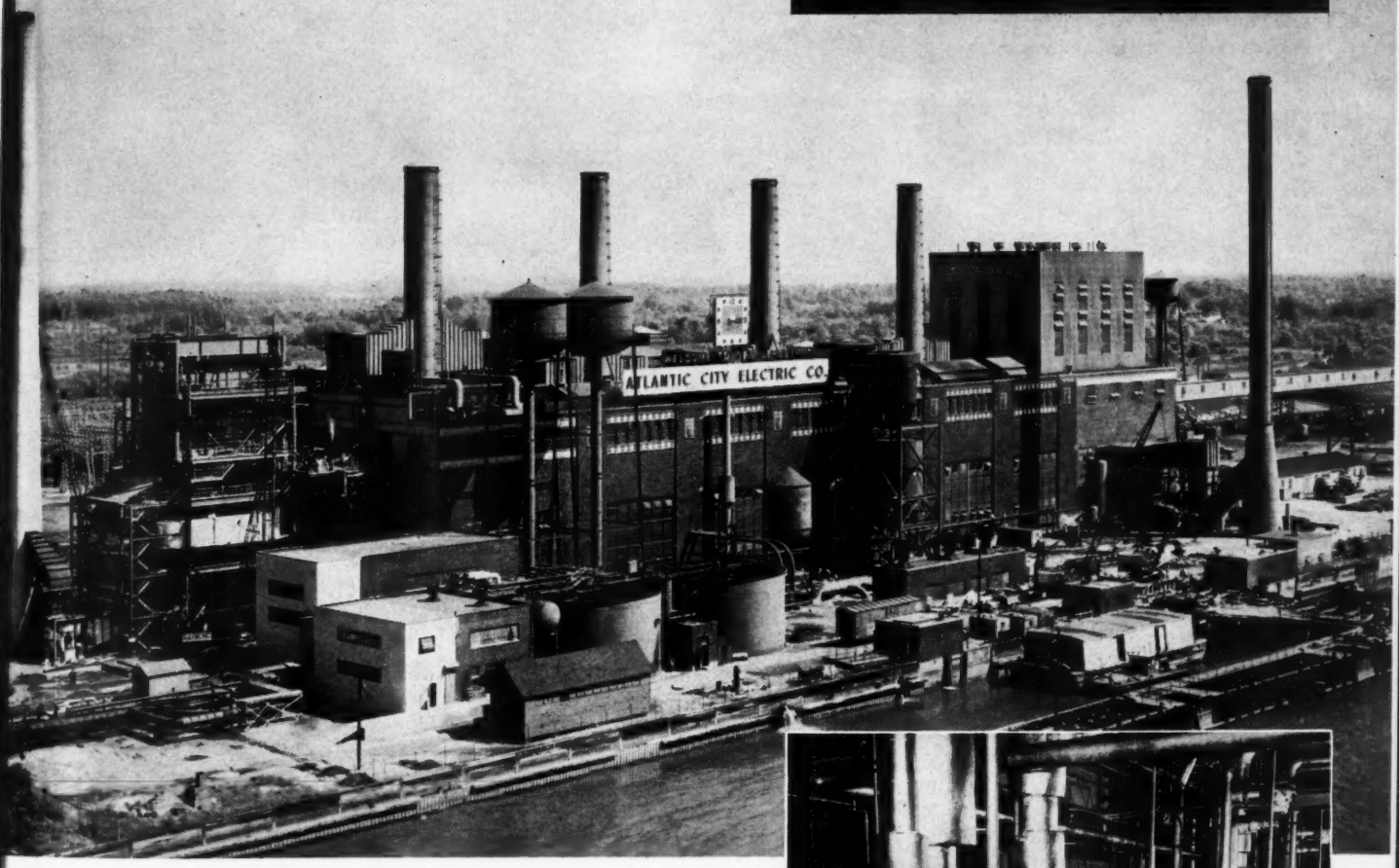
FLORIDA

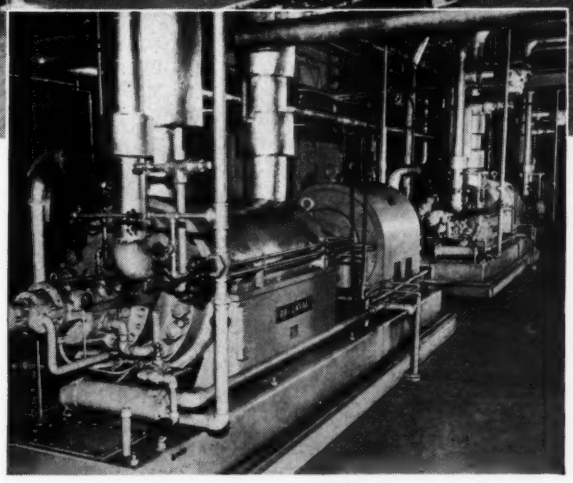
John Carl Amis, Jr.
Fort Myers, Florida.
Sewage disposal system, plant, and collection system. First unit in 1400-acre subdivision north of Fort Myers, Fla. (civil) $120,000. Client, Bond Land Co.

Modern central stations use

DE LAVAL

BARREL TYPE BOILER FEED PUMPS





Three ten-stage De Laval high pressure, barrel type boiler feed pumps, are on the line at the Deepwater Station of the Atlantic City Electric Company. Shown above is an aerial view of this station located in Penns Grove, New Jersey at the southern end of the Jersey Turnpike. Each pump delivers 675 gpm to the boiler for a total flow of 685,000 pounds per hour. Each pump operates at 1762 psi with temperature at 287 F., and is driven by a 900 hp motor.

When it came time to modernize one of their existing facilities, Atlantic City Electric Company and Gibbs & Hill, Inc., consulting engineers, chose two similar De Laval pumps to serve a new 79,000 kw generator.

IMO Pumps For Fuel Oil Service

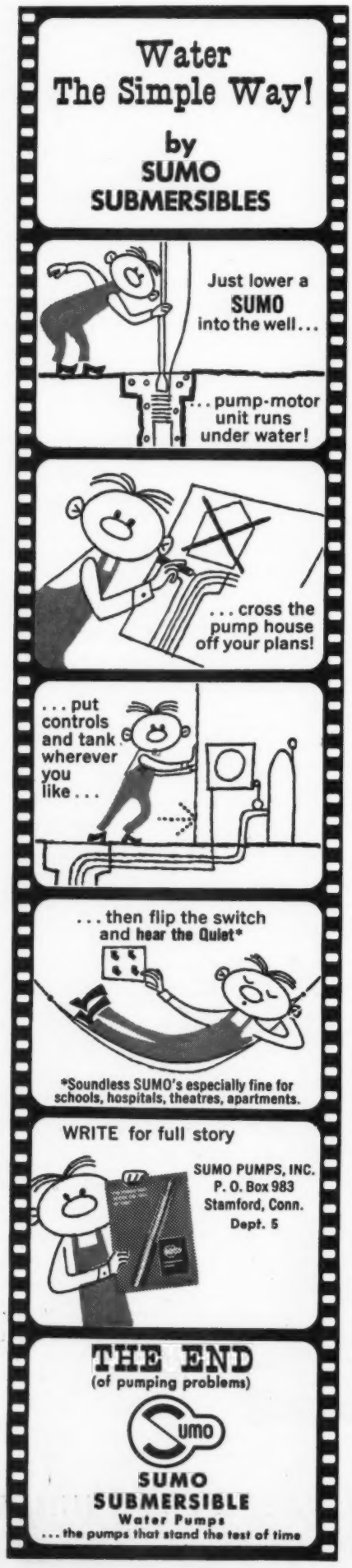
Also doing an important job in this Atlantic City Electric Company station are De Laval IMO screw-type positive displacement pumps. They supply fuel oil to the burners round the clock.

Send for De Laval Bulletin 1506, which contains helpful data.

DE LAVAL *Boiler Feed Pumps*

DE LAVAL STEAM TURBINE COMPANY
894 Nottingham Way, Trenton 2, New Jersey

DL-388



Simmerson, Bell & Mock.
Palm Beach, Florida.
Palm Beach County 1800-acre industrial district. Client, A. E. & R. F. Raidle, Inc.

Brockway, Weber & Brockway.
West Palm Beach, Florida.
Village of Palm Springs, Fla., earthwork, paving, drainage, bridges. (civil, struc.) $1,500,000. Client, Rexland, Inc.

Village of Palm Springs, Fla. Sewage collection, water distribution, sewage plant, water plant. (civil) $1,000,000. Client, Palm Springs Utility Corp.

Village of North Palm Beach, Fla. Earthwork, paving, drainage, bridges, bulkheads, water supply, treatment and distribution, sewage collection and treatment. (civil, struc.) $2,200,000. Client, City.

Lake Park, Fla. Water distribution and sewage collection. (civil) $800,000. Client, Palm Beach County Utility Co.

Riviera Beach, Fla. Lewis Industrial Park, earthwork, paving, drainage, railroads, water distribution, sewage collection, and treatment. (civil) $1,800,000. Client, Mission Co., Inc.

Tropic Palms subdivision, Palm Beach County, Fla. Earthwork, paving, drainage, bridges, water supply and distribution. (civil, struc.) $1,100,000. Client, Tropic Palms, Inc.

Boca Raton, Fla. Earthwork, paving, drainage, water distribution, bulkheads, bridges for 2000-lot subdivision. (civil, struc.) $1,500,000. Client, Boca Sales Corp.

IDAHO

R. D. Stoker & Associates.
Soda Springs, Idaho.
Design of Larnark Road, Bear Lake County, Idaho. 5 miles, Farm to Market Road. (civil) $95,000. Client, Bear Lake County.

Layout and development of Lakeview 62-lot subdivision, Soda Springs, Idaho. (civil) $25,000. Client, William S. Gragon.

United Engineers & Constructors.
Philadelphia, Pennsylvania.
Design of full-scale nuclear energy boiling water facility located near Idaho Falls, Idaho. Client, Argonne National Laboratory.

ILLINOIS

Sargent & Lundy.
Chicago, Illinois.
Station #6 addition. Client, Commonwealth Edison Co., Chicago, Illinois.

IOWA

Daniel B. Stevenson, Jr., Consulting Engineer.
Des Moines, Iowa.
Addition to Bankers Life Co. home office building, Des Moines, Iowa. (mech., elec.) $2,000,000. Client, Tinsley, Higgins, Lighter and Lyon.

Look Publishing Co. building, Des Moines, Iowa. (mech., elec.) $1,000,000. Client, Amos Emery and Assoc.

Addition to Iowa Lutheran Hospital, Des Moines, Iowa. (mech., elec.) $900,000. Client, Wetherell and Harrison, Arch.

Air conditioning of existing telephone exchange building, Oskaloosa, Iowa. $30,000. Client, Northwestern Bell Telephone Co.

KANSAS

Davis & Razak, Consulting Engineers.
Dodge City, Kansas.
Water improvements, ground level storage, and line extensions. (civil) $100,000. Client, Ness City, Kans.

Wilson & Company, Engineers & Architects.
Salina, Kansas.
Water storage reservoir and water softening treatment plant, Parsons, Kans. (civil, struc.) $1,300,000. Client, City of Parsons, Kans.

Airport improvements, terminal building, runway widening, runway extension, lighting, and parking facilities. (civil, struc., mech., elec.) $750,000. Client, City of Salina, Kans.

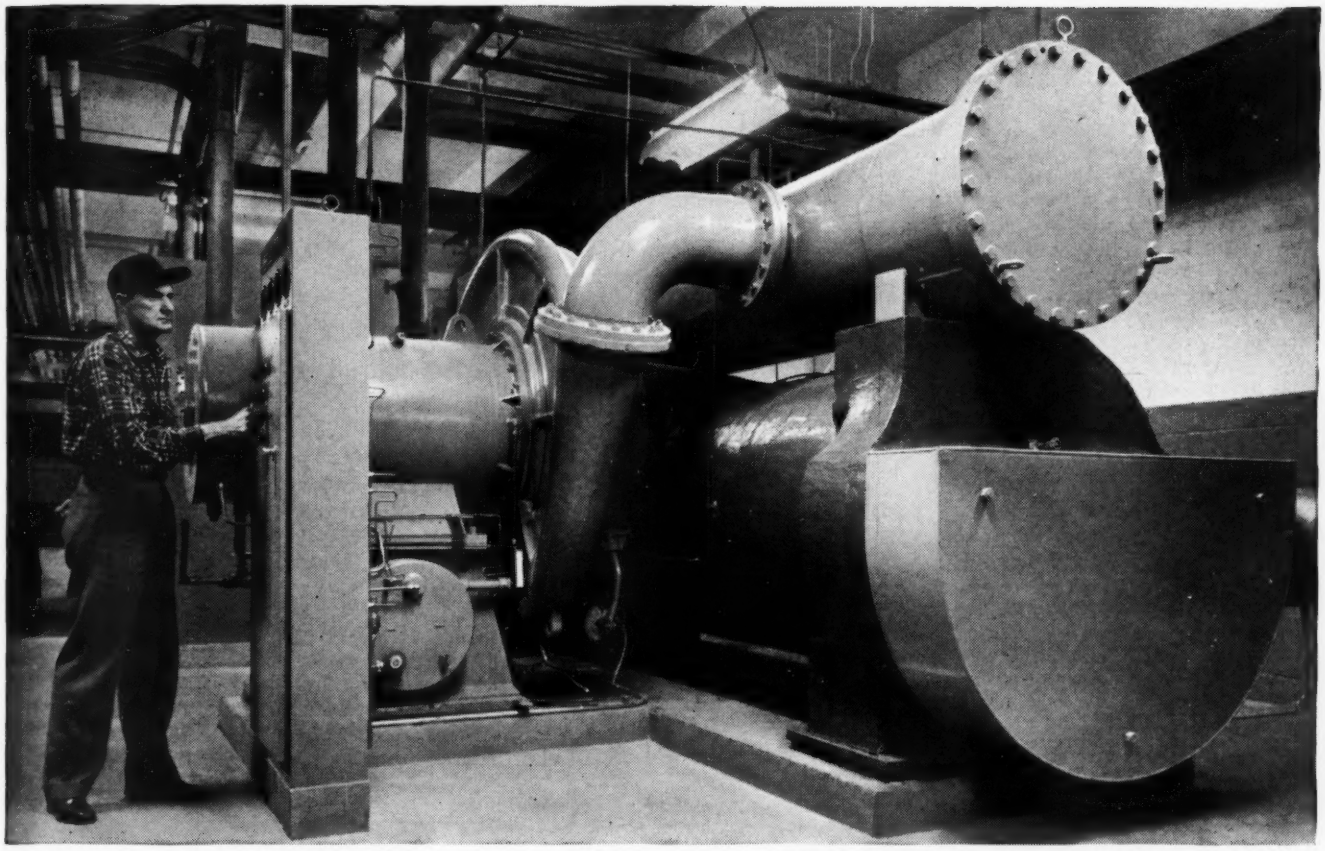
Industrial waste treatment plant for refinery wastes and storm runoff water, McPherson, Kans. (chem., struc., mech., civil, elec.) $800,000. Client, National Cooperative Refinery Assoc., McPherson, Kans.

Interstate Highway #1, 20 miles of 4-lane highway and structures. (civil, struc.) $8,000,000. Client, State Highway Commission of Kansas, Topeka.

To Report
NEW PROJECTS

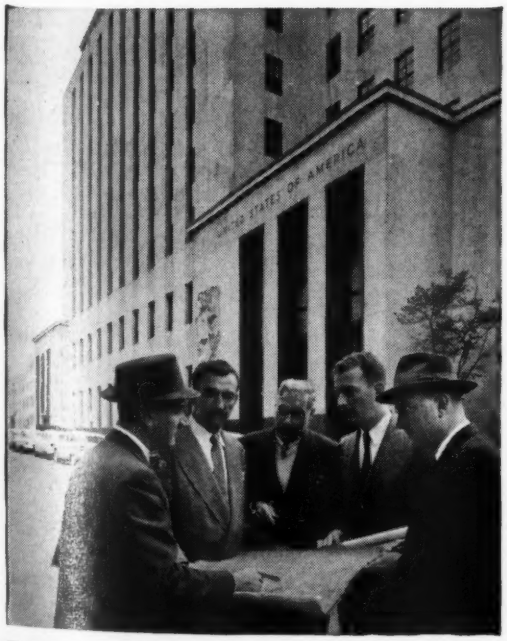
Please fill out the postage-paid card between pages 170 and 171.

AMERICAN BLOWER AIR CONDITIONING



New Orleans Federal Office Building's Tonracs maintain constant chilled-water temperature—regardless of load.

Tonrac provides air-conditioning load variations from 0 to 100% in New Orleans Federal Building



Teamwork like this brought effective air conditioning to the Federal Office Building, New Orleans. L. to r.: I. A. Lindberg, American Blower; G. M. Graf, group supvr., General Services Administration; E. A. Stack, chief engineer, Federal Building; G. A. Hero III and A. A. Hero, Comfortair Co.

To provide controlled indoor comfort, the U.S. Government installed air conditioning in their New Orleans Federal Office Building.

For the heart of the system, they chose two 300-ton American Blower TONRAC® centrifugal refrigeration machines. Here's why, in the words of Alvin Hero, president, Comfortair Company, Inc., New Orleans air-conditioning contractors:

"After inspecting available units, Tonracs were selected because they were found to be most flexible, easy to install; and they met and exceeded government requirements.

"In this installation, humidity control was the primary factor. Not only was it necessary for the Tonracs to operate at full capacity, but the lower variable—below 10% of capacity—was equally important to keep humidity low at night and during week ends."

If your client's building or remodeling plans include air conditioning, why not call in an American Blower representative at the *planning* stage? American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

AMERICAN BLOWER

Division of **AMERICAN-Standard**

Air conditioning equipment for every business

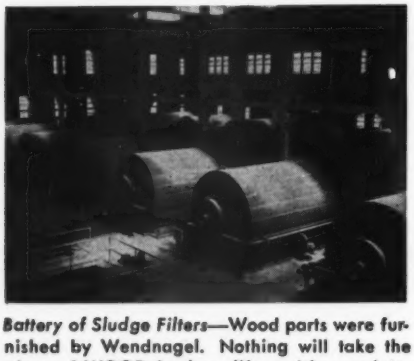
Have Wendnagel Design and Build Your . . .

"corrosion resistant"

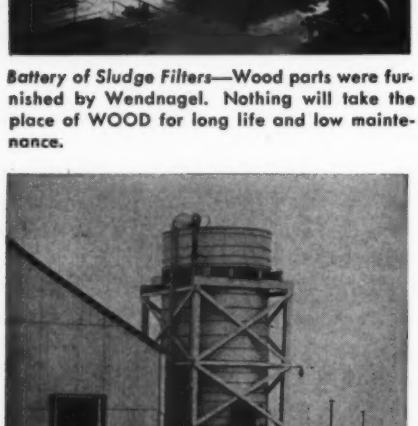
Processing & Storage Equipment of Wood

Widely used in Chemical Processing, Storage and the handling of industrial wastes.

Wendnagel Wood *"corrosion resistant"* construction means long life and low maintenance. Wendnagel Engineering will give you Wood-Processing Equipment—that will cut your original and operation costs.



Battery of Sludge Filters—Wood parts were furnished by Wendnagel. Nothing will take the place of WOOD for long life and low maintenance.



This degasifier built by Wendnagel — has proved to be the most practical and economical type of equipment for this job.

Send us details of your requirements for solution.

Wendnagel & Co., Inc.

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Burgwin & Martin.
Topeka, Kansas.
17.5 miles interstate highway, 4-lane construction, controlled access, 30 bridges, U.S. 50 S, Franklin County, Kans. (civil, struc.) $8,000,000. Client, Kansas Hwy. Com.

Shawnee County, Kans., 7.0 miles interstate highway, 4-lane controlled access. (civil, struc.) $5,000,000. Client, Kansas Hwy. Com.

Nemaha County, Kans., 9.0 miles primary highway. (civil, struc.) $750,000. Client, Kansas Hwy. Com.

Wallace County, Kans., 20 miles primary highway. (civil, struc.) $1,500,000. Client, Kansas Hwy. Com.

Marshall County, Kans., 9.0 miles primary highway. (civil, struc.) $750,000. Client, Kansas Hwy. Com.

Park facilities, swimming pools, tennis courts, drives. (civil, mech., elec.) $400,000. Client, City of Topeka, Kans.

Traffic survey. (civil) Client, City of Manhattan, Kans.

Traffic survey. (civil) Client, City of Atchison, Kans.

Traffic survey and long range plan. (civil) Client, Wyandotte County.

Traffic survey and long range plan. (civil) Client, City of Salina, Kans.

KENTUCKY

Parsons, Brinckerhoff, Hall & Macdonald.
New York, New York.
Pennsylvania Railroad bridge, Louisville, Kentucky. Study to determine feasibility of replacing existing lift span with longer span bridge or adding second lift span to present structure. Client, U.S. Corps of Engineers.

LOUISIANA

J. S. Boyd & Associates.
Shreveport, Louisiana.
Castor, La. Water supply and distribution system for town and adjacent area (civil) $70,000. Client, Mayor Larie Sledge.

Millwee and Associates.
Bellaire, Texas
Industrial waste treatment plant, Lake Charles, La., Petroleum Industries, Inc. (civil, struc., mech., elec.) $40,000. Client, Lummus Co.

MASSACHUSETTS

Consulting Engineers, Inc.
Boston, Massachusetts.
Reconstruction and relocation of culvert and brook, Maple Street, Marlboro, Mass. (civil) $70,000. Client Commonwealth of Massachusetts, Division of Waterways.

MICHIGAN

Smith, Hinchman & Grylls Associates, Inc.
Detroit, Michigan.
Hospital, county board of health building, and laundry building. $15 million (est.) Client, Wayne County General Hospital.

Metropolitan Hospital and Clinic, Detroit, Mich.

Michigan Veterans facility, Grand Rapids, Mich.

Presbyterian Convalescent Hospital, Redford Township.

St. Joseph Mercy Hospital, Pontiac.

Parsons, Brinckerhoff, Hall & Macdonald.
New York, New York.
Development of heavy duty lifting mechanism, employing ball-bearing screw assembly and preparation of design drawings for application of this mechanism to elevating offshore drilling barges. Client, Industrial Brownhoist Corp., Bay City, Mich.

Medema, Van Kooten & Associates.
Grand Rapids, Michigan.
Watermain extensions. (civil) $125,000. Client, Paris Township, Kent County, Mich.

Michigan Associates.
Lansing, Michigan.
Design highway relocation, US-12. (civil) $3,750,000. Client, State.

Design Michigan State Police central storage building. (struc.) $70,000. Client, Michigan State Police.

Design alterations to Michigan State Police administration building. (struc.) $42,000. Client, Michigan State Police.

Design Michigan State Police radio service and installation building. (struc.) $65,000. Client, Michigan State Police.

Ground water pollution study, Bronson, Mich. $20,000. Client, City.

Arthur H. Leach.
Bridgeport, Michigan.
Drain, Ithaca, Michigan. $125,000. Client, County Drain Commissioner.

Twin Lakes Village subdivision, water, streets, and survey, Oakland County. $500,000. Client, J. M. Cook.

Cole-Easlick Developments, 2000 acres, subdivisions, Oakland Coun-

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Wholesale Elec. Sup.
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Ft. Wayne: Mossman-Yarnelle Co.
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Kansas City: W. T. Foley Elec. Co.
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Portsmouth: Mass. Gas & Elec. Light Co.
NEW JERSEY
Atlantic City: Franklin Elec. Sup. Co.
Camden: Camden Elec. Fix. Co.
NEW YORK
Albany: Havens Elec. Co. Inc
Binghamton: Freije Elec. Sup. Co.
Buffalo: Buffalo Incan. Light Co. Inc.
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Cleveland: H. Leff Electric
Columbus: Elgee Elec. Co.
The Loeb Elec. Co.
Dayton: Martin Elec. Co.
Toledo: Gross Elec.
Youngstown: Mart Industries
OKLAHOMA
Tulsa: Lawson Elec. Co.
PENNSYLVANIA
Allentown: Coleman Elec. Co.
Erie: Kraus Elec. Co.
Harrisburg: Fluorescent Sup. Co.
Hazleton: Power Elec. Co. Inc.
New Castle: Midwestern Elec. Co.
Philadelphia: Ace Lighting Fix. Co.
Gold Seal Elec. Sup. Co.
Sylvan Elec. Fix. Co.
Pittsburgh: Allied Elec. Sup. Co.
Argo-Lite Studios
Doubleday-Hill Elec. Co.
Wally Elec. Sup. Co.
Reading: Coleman Elec. Co.
Scranton: Lewis & Reif
Wilkes-Barre: Anthracite Elec. Sup. Co.
RHODE ISLAND
Pawtucket: Major Elec. Sup. Co.
Providence: Leavitt Colson Co.
SOUTH CAROLINA
Anderson: Sullivan Hdwe. Co.
Columbia: Capitol Elec. Sup. Co.
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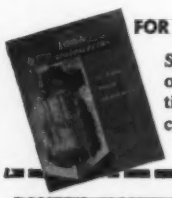

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ty, Mich. $100,000. Client, Lakeland Development Corp., Milford, Mich.

S. J. Callahan & Company.
Kansas City, Missouri.
Addition to warehouse, North Kansas City. (civil, struc., mech., elec.) $300,000. Client, A. M. Castle & Co.

Uri Seiden & Associates.
Kansas City, Missouri
Music and Applied Arts Building, 3-story, reinforced concrete, Warrensburg, Mo. $1,000,000. Client, Everitt & Keleti, Arch.

Leon Maslan & Company.
Kansas City, Missouri.
Truck terminal, main offices, dock facilities, and repair shop, 32,000 sq ft, air conditioned. Kansas City, Mo. (civil, struc., mech., elec.) $300,000. Client, Byers Transportation Co.

Allgeier, Martin & Associates.
Joplin, Missouri.
Sewerage program. (civil) $150,000. Client, Doniphan, Mo.

Sewerage program. (civil) $300,000. Client, Mt. Grove, Mo.

Sewerage program. (civil) $200,000. Client, Flat River, Mo.

Sewerage program. (civil) $250,000. Client, Richland, Mo.

NEVADA

J. S. Hamel, Engineer.
Burbank, California.
Clark County Convention Center, Las Vegas, Nev. Air conditioned exhibit hall and auditorium for 6000 people. (mech., elec.) $4,500,000. Client, Adrian Wilson & Assoc.

NEW JERSEY

Slocum & Fuller.
New York, New York.
Bayonne Hospital extension, Bayonne, N.J. (mech., elec.) $2,300,000. Client, Ferrenz & Taylor.

Lev Zetlin, Consulting Engineer.
New York, New York.
Newcomb Hospital, Vineland, N.J. (struc.) $1,200,000. Client, Helge Westermann, Arch.

NEW MEXICO

J. L. Breese & Associates.
Santa Fe, New Mexico.
Methodist Church, heating, air conditioning, and plumbing, Farmington, N.M. (mech.) $350,000. Client, Garland & Phillippi, Architects & Engineers, Farmington, N.M.

Southern Union Gas Co. Santa Fe office, heating and air conditioning existing building. (mech.) $15,000. Client, Southern Union Gas Co.

NEW YORK

Meyer, Strang & Jones.
New York, New York.
Astor Plaza, New York City. (mech., elec.) Client, Astor Plaza, Inc.

Daily News, New York City. (mech., elec.) Client, Harrison & Abramovitz, Arch.

J. P. Morgan & Co. modernization. (mech., elec.) Client, Rogers & Butler, Arch.

99 John St., New York City, modernization. (mech., elec.) Client, Shreve, Lamb & Harmon Assoc.

Chase Bank, New York City. (mech., elec.) Client, Skidmore, Owings & Merrill.

Riverside Church, south wing, New York City. (mech., elec.) Client, Collens, Willis & Beckonert.

New York Times printing plant, New York City. (mech., elec.) Client, Eggers & Higgins.

Equitable Life Assurance Society, New York City. (mech., elec.) Client, Skidmore, Owings & Merrill.

M. Friedman, P.E.
West Nyack, New York.
Office building, 60 x 100 feet, 3-story and basement, 2 elevators, cooling and heating through ducts. (struc., mech., elec.) $200,000. Client, Tischler & Comerro, Arch.

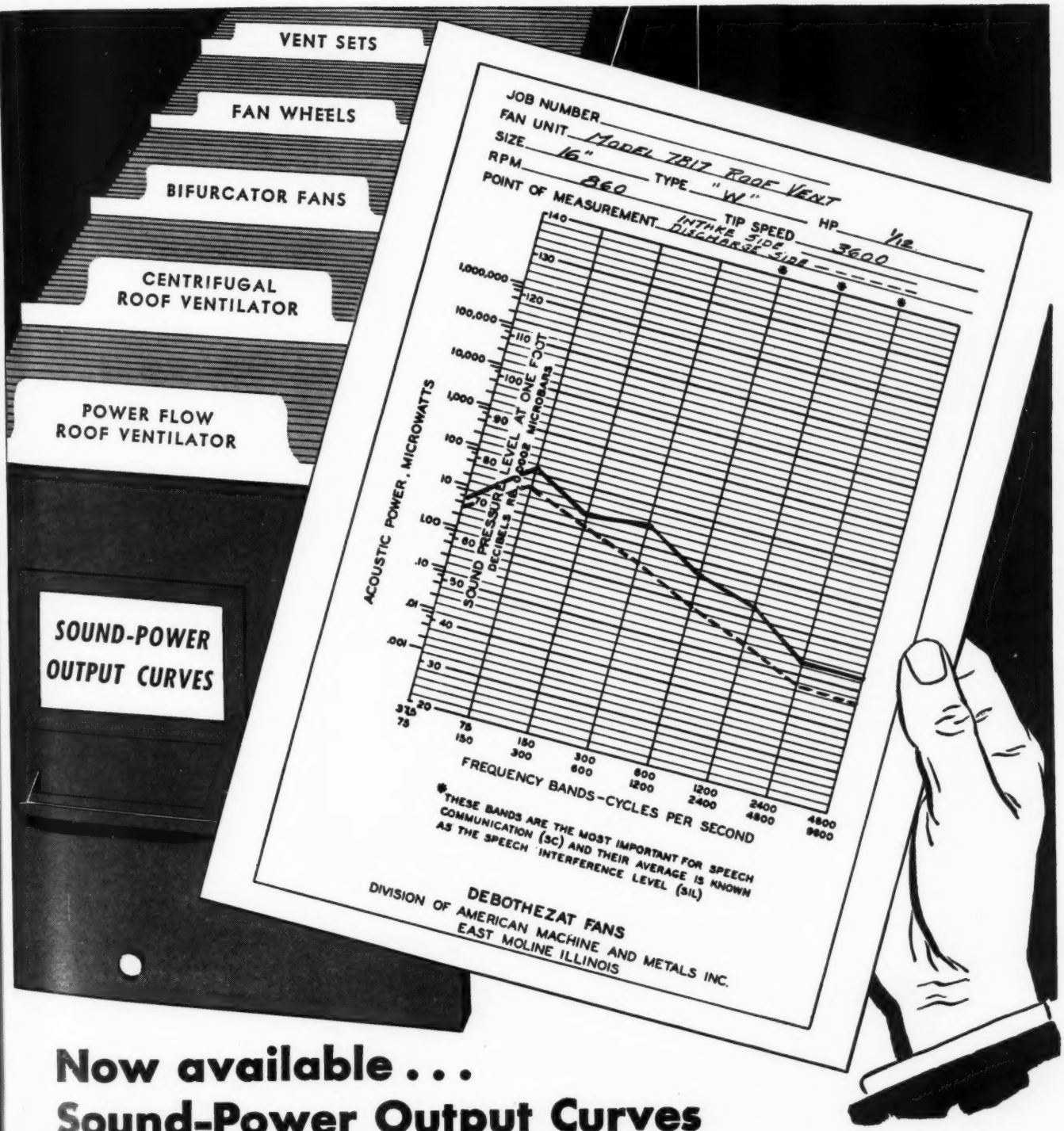
Gruenwald Associates.
Long Island City, New York.
New boiler. $60,000. Client, Queensboro Farm Products, Inc., Canastota.

Investigation for new refrigeration plant. Client, Queensboro Farm Products, Inc., Canastota, N.Y.

Rehabilitation of distribution depot. $75,000. Client, One Oak Dairy, Westbury, N.Y.

Henry J. Cambell, Jr.
Mineola, New York.
Franklin National Bank, Nassau County, N.Y. Heating, air conditioning, and electrical service changes in three existing branch bank buildings. Additions to an existing air conditioning installation at main office. (mech., elec.) $50,000. Client, Franklin National Bank.

St. John's Lutheran Church, Merrick, N.Y. New church facilities interconnecting with existing building. Heating, air conditioning, plumbing, and electrical work. (mech., elec.)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$200,000. Client, Architects, Merrill & Holmgren.

Syosset Community Church, Syosset, N.Y. Church, school, chapel, fellowship hall, and auditorium. Heating, ventilating, and electrical work. (mech., elec.) $150,000. Client, Architects, Watterson & Watson.

Hempstead Bank, Westbury office. Installation of air conditioning and change in electrical service for existing branch office. (mech., elec.) $12,000. Client, Hempstead Bank.

NORTH CAROLINA

J. N. Pease & Company, Engineers-Architects.
Charlotte, North Carolina.
Wilmington, N.C. Extension of existing docks for approximately 1200 feet southward along Cape Fear River. (civil, struc.), $2,000,000. Client, State of North Carolina Ports Authority.

Walter G. Smith.
Durham, North Carolina.
Non-commissioned officers open mess, Fort Bragg, N.C. Heating and air conditioning. (mech., elec.) $1,000,000 (est.) Client, Arch., Dan McMillian & Assoc., Fayetteville, N.C.

OREGON

N. W. Haner & Associates.
Portland, Oregon.
Sewage collection and treatment plant. (civil) $210,000. Client, City of Clatskanie, Ore.

Sewage collection and treatment plant. (civil) $488,000. Client, City of St. Helens, Ore.

Storm drains. (civil) $183,000. Client, City of St. Helens, Ore. Umatilla boat basin. (civil) $20,000. Client, Port of Umatilla, Ore.

PENNSYLVANIA

Robert Floyd.
Geneva, New York.
New elementary school, Williamsport, Pa. (civil) $600,000. Client, White & Helm, Arch.

Parsons, Brinckerhoff, Hall & Macdonald.
New York, New York.
62nd Street bridge, Pittsburgh, Pa. Determine type and cost of proposed new high-level crossing of Allegheny River, east of existing 62nd street bridge. Client, Allegheny County.

Port Commission, Erie, Pa. Development of municipal port facilities in Erie Harbor of Lake Erie for exploratory boring program in submerged and land areas of proposed port terminal site. Client, Erie, Pa.

TEXAS

William S. Merliss & Associates.
Houston, Texas.
Residence. (struc., mech., elec.) $55,000. Client, Graham Scott, Arch.

Residence. (struc.) $40,000. Client, Thompson McCleary.

Oak Forest Christian Church. (civil, struc., mech., elec.) $65,000. Client, Oak Forest Christian Church.

Two residences. (struc.) $55,000. Client, Delwin James, Arch.

Warehouse and office building. (struc., civil, mech., elec.) $85,000. Client, Le Blanc Construction Co.

J. R. Hobbs, office and warehouse. (civil, struc., mech., elec.) $55,000. Client, James B. Johnson.

Office building. (struc.) $55,000. Client, Arthur Flynn, Arch.

Residence. (struc.) $35,000. Client, George Fassulo, Arch.

Store. (struc.) $40,000. Client, George Fassulo, Arch.

Residence. (struc., mech., elec.) $100,000. Client, Allen Heidbreder.

Poultry processing plant, Weimar, Texas. (civil, struc., mech., elec.) $360,000. Client, M. G. Inc., Weimar.

UTAH

The Fluor Corporation, Ltd.
Los Angeles, California.
Design, engineer, and construct crude unit, Salt Lake City. $2,000,000. Client, Utah Oil Refining Co.

FOREIGN

Singmaster & Breyer.
New York, New York.
Engineering, design, procurement, and construction of 10,000 t/d fresh water from sea water plant, including turbogenerator house, maintenance shop, warehouse, roads, electrical distribution, transmission system for 15,000 kw of electric power generated from high pressure steam. Client, Island Government of Aruba.

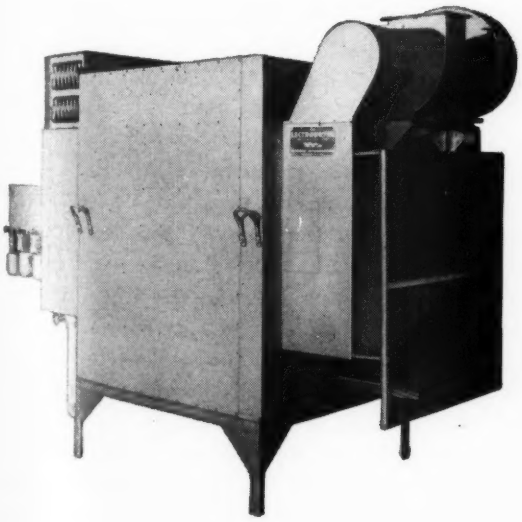
Herbert Manuccia, P. E. and Assoc.
Washington, D. C.
Lajes Air Force Base, Azores, Portugal. Enlarge base facilities. (civil, struc.) $1,000,000. Client, Groll, Beach & Assoc., Arch., Wash., D.C.

Fred S. Dubin Associates.
Hartford, Conn.
American Embassy building, Beirut, Lebanon. (mech., elec., sanitary)

What do you mean

hot and humid?

Temperature 38°, humidity 98%—mid-winter, but just about as nasty and uncomfortable a day as you could imagine. The high humidity made it so.



It doesn't have to be hot to be humid!

Like people, many a process suffers from too much moisture in the air, even when that air is *cold*. Out of doors, fog forms to warn you of its presence. Indoors, unfortunately, high humidities are not so apparent, and we're not aware of moisture in the air surrounding us.

If moisture were pink, we'd be living in a world of color—you'd see this danger signal and take steps to remove the water from the air. Without this warning, processors must be continually on the alert, measuring humidity and controlling it.

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Books

For the Libraries of Consulting Engineers

LINEAR PROGRAMMING, by Dakota Ulrich Greenwald; The Ronald Press Co.; 75 pp.; $3.00.

Reviewed by
David R. Turnbull
Day & Zimmermann, Inc.

Those engaged in consulting engineering, particularly in the management phase, will find that this book explains not only some of the basic mathematics involved in linear programming, but also gives insight into the variety of management problems whose solution may be achieved through this relatively new technique.

To the uninitiated, the following definition is helpful: ". . . . linear programming may be described as a mathematical technique for determining the most effective, desirable, or profitable course of action to take when the situation is governed by many known variables and conditions."

Although the subtitle of this book, "An Explanation of the Simplex Algorithm," may at first frighten readers who are engineers rather than mathematicians, most of the reader's apprehensions will have disappeared by the time the preface has been completed. It is reassuring to learn that the author will explain, rather than prove, the mathematical theory that is involved.

Basically, the text under consideration is an explanation of George B. Dantzig's simplex technique for arriving at hand computed solutions to problems of a linear programming nature. Nineteen problems, of increasing complexity, are used to demonstrate the mechanics of mathematical formulation of management problems and to give the reader an appreciation as to possibilities and limitations of the simplex method of computation.

The first types of problems considered are those dealing with most profitable production scheduling with a variety of limiting factors including machine time, policy requirements, product mix, and exact restriction. Included in this group are two problems dealing with alternative solutions — where from the solution it becomes apparent that although the answer is optimum for the conditions stated, there exists a preferable program if original conditions can be altered slightly.

Further use of the simplex algorithm is demonstrated in connection with non-optimum programs. In such problems the objective becomes one of determining the relative amount of loss that accrues from the several less-than-optimum programs.

Finally the author demonstrates several problems where minimization rather than maximization is desired in the functional equation. Here the criteria becomes that of least amount of time, or lowest cost rather than greatest profit.

The engineer reader will find this book to be more than a

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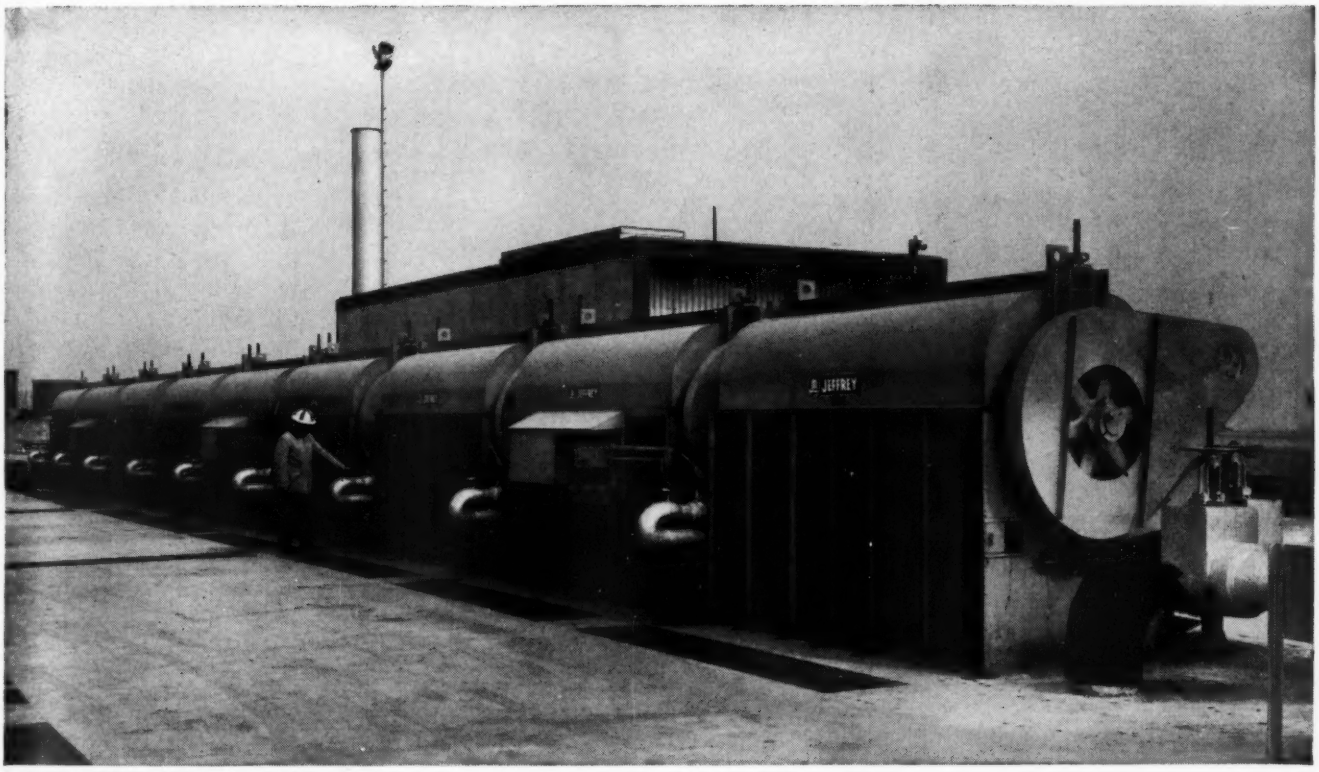

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demonstration of the author's mathematical talents. Prof. Greenwald very patiently leads the reader through the theory and invites him to try his own mathematical wings by putting theory into action. Certainly insight into the type of management and business problems amenable to mathematical formulation makes the reading of *Linear Programming* worthwhile, although many will decide to leave the detail work to the mathematician.

●

PROJECT ENGINEERING OF PROCESS PLANTS, by Howard F. Rase and M. H. Barrow; John Wiley & Sons, Inc.; 692 pp.; $14.25.

Reviewed by
John J. Mahoney
Consulting Engineer

Consulting engineers in all fields will find this book useful. It describes the activities of the supervising engineer on an industrial construction project who coordinates the work in the office.

The first eight chapters define the "project engineer" and explain the various steps in plant design. Chapters 7 and 8 on scheduling and engineering design and drafting are excellent.

Business and legal aspects of project management are taken up in the next three chapters. These are also well written.

Thirteen chapters are devoted to design details and the final chapter to field construction.

There is much valuable material on project management, drafting practices, engineering and drafting manpower requirements, costs, and job administration. Suggested reading references are complete and well located throughout the volume.

A typical job breakdown is given showing the amount of time allocated to engineering, procurement, and construction. The average number of hours per drawing is given for piping, structural, electrical, and other design work. Some of the data on typical hourly and monthly wages and salaries appear to be low, but this may be a matter of geography.

The reader will find it difficult, however, to distinguish between a "process plant" and other industrial complexes. Unfortunately, the authors have not defined this type of plant, and one can only surmise that it denotes facilities for the production of petroleum, pharmaceuticals, foods, and organic and inorganic chemicals.

The cost-plus type of contract, popular for this work, deservedly comes in for some criticism because of the tendency of the client to take over the consulting engineer's personnel and, in effect, infringe on the ethical and independent practice of engineering.

The authors' handling of field construction (only one chapter) and their predilection toward specialization (e. g. "pump engineer") connotes a large, impersonal type of organization. This is unfortunate since there are many small, closely knit firms in this field.

This book will find many users in the consulting engineers' offices. It will help in preparing bids and scheduling engineering, drafting, and construction activities.

The many excellent charts, graphs, diagrams, and photographs will enable one without training in chemical engineering to follow a process plant project in the office and field with little difficulty.

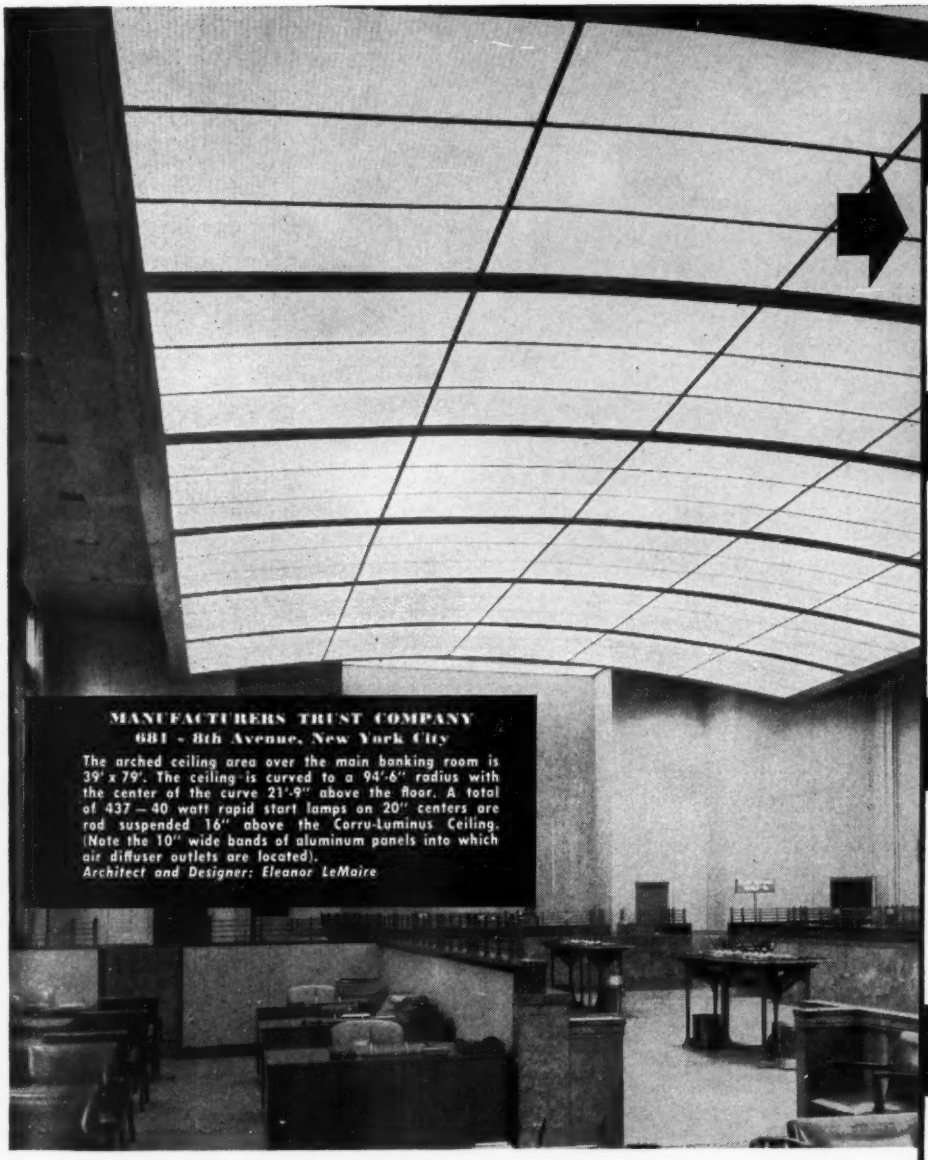
There are many valuable cost yardsticks to be found which will assist greatly in the financial management of such projects.

All things considered, it is a good book to have around.

ALSO AVAILABLE

FUNDAMENTALS OF MECHANICAL DESIGN, by Richard M. Phelan; McGraw-Hill Book Co., Inc.; 562 pp.; $8.75.

The major emphasis in this book is placed on what can be done, what principles are involved, and where one can find



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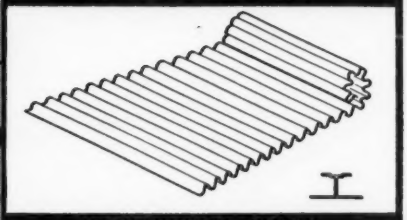

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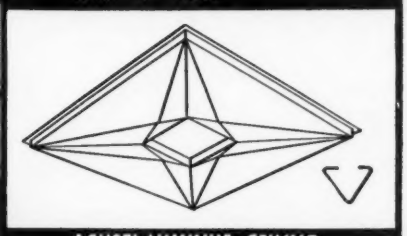

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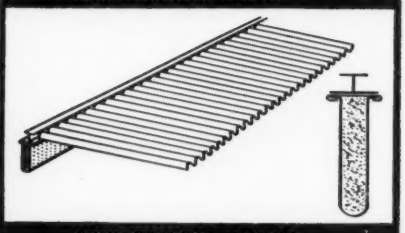

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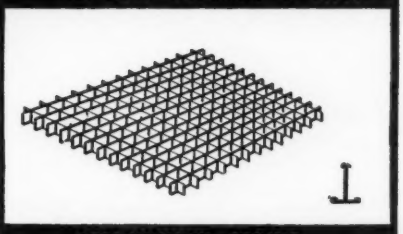

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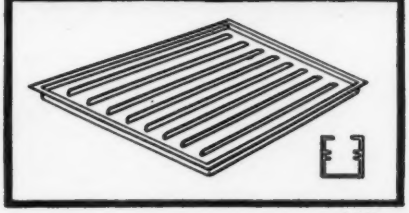
Square Track



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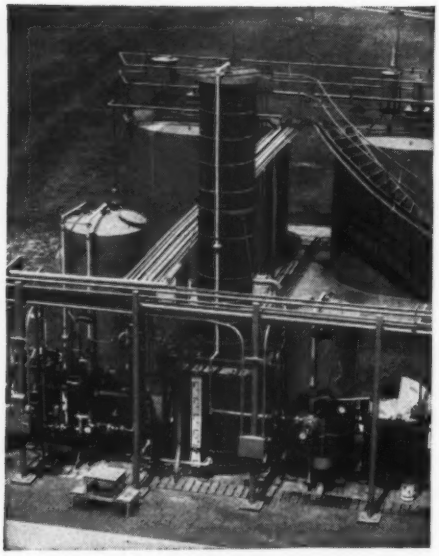

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"Guide to Atomic Energy Literature for the Civilian Application Program," TID 4575, by the U.S. Atomic Energy Commission, describes the technical information publications and services offered by the Commission and tells how and where to obtain them. The Guide may be obtained without charge from the Commission's Technical Information Service Extension, P.O. Box 1001, Oak Ridge, Tenn.

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The Illuminating Engineering Society has available a new booklet, "American Standard Practice for Protective Lighting," for 50¢ a copy. The report treats of protective plant lighting as separate from lighting for industrial production and provides descriptive and application data for a wide variety of outdoor lighting equipment, including types of light sources; gives lighting specifications, and recommendations for specific areas; covers circuiting; and illustrates with drawings, diagrams, and charts numerous protective lighting problems.

The Society also has published recently a 16-page booklet, "Lighting Outdoor Locations of Central Station Properties." Individual copies are 50¢ from the Publications Office of the Society at 1860 Broadway, New York 23.

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The Association of Consulting Chemists and Chemical Engineers has published its 16th edition of "Consulting Services." Members of the Association are listed by field, name, and location. Copies are available from the Association at 50 East 41st St., New York 17.

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The American Road Builders Association has available two bulletins of interest to the consulting engineer. The first contains two articles: "Reinforced Concrete Pavement Design Practice in Michigan," by C. H. Cash and "Economy of Standardization of Reinforcement for Concrete Pavements," by Warren D. Fish. The second bulletin covers "Welded Wire Fabric Reinforcement of Asphaltic Concrete," by Edward M. Howard and "Welded Wire Fabric in Bituminous Surfaces," by Norman G. Smith. Each bulletin is 50¢ a copy from the Association at World Center Building, Washington 6, D. C.

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The American Management Association has available a list of all its publications, films, and other material released since issuance of the fall catalog. Copies are available from the Association at 1515 Broadway, New York 36, N.Y.

FILMS

The American Marketing Association has prepared a booklet titled "Catalogue of Films," which is a compilation of business films selected for their pertinence to the marketing field. Copies may be obtained from the Association at 27 East Monroe St., Chicago 3, Ill. Cost is 50¢ each.

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"BUILDING BETTER FOR LESS," Olin Mathieson Chemical Corp., sound and color, 13 min., 16 mm.

This film shows how polyethylene can be used in permanent and temporary applications in the building industry. It discusses moisture problems and how to solve them. ▲▲